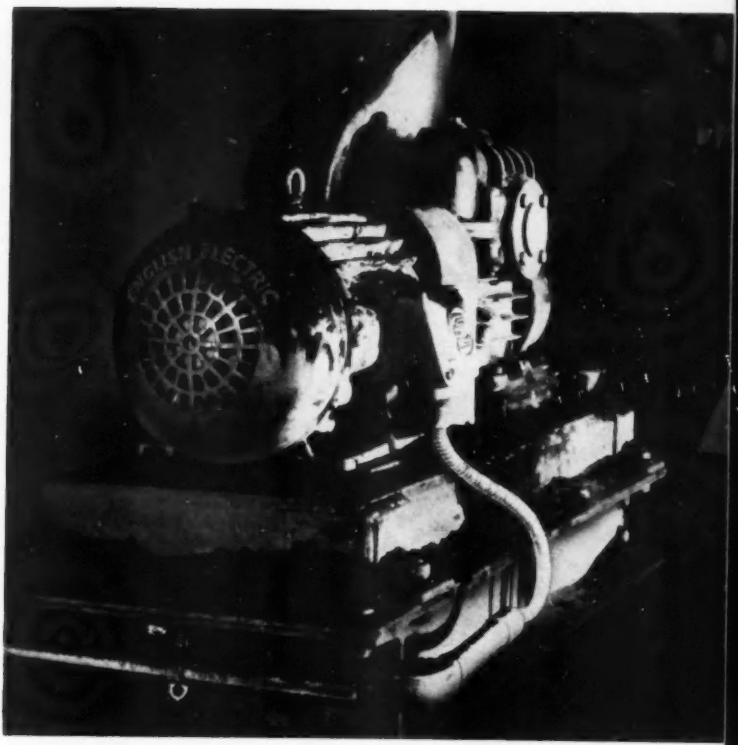
ELECTRICAL TIMES

THURSDAY
7 MAY
1953
NINEPENCE

The LY range of standard motors

One of the many British Standard dimensioned motors now in service. Illustrated is a B.204, 2 H.P., 1430 r.p.m. motor driving a Worm Reduction Gear in a Foundry.

Specify an 'ENGLISH ELECTRIC' Standard Motor.



'ENGLISH ELECTRIC'
industrial motors

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2
Industrial Motor Works, Bradford

WORKS: STAFFORD, PRESTON, RUGBY, BRADFORD, LIVERPOOL, ACCRINGTON

BM.13

for festive occasions—

FIESTA-FLOOD

Many of your customers may still be requiring Floodlighting Equipment for their Coronation displays. Simplex Fiesta-Floods and other types of floodlights can be delivered from stock immediately. Fiesta-Floods take a 300-500 watt General Service lamp, a 500 watt Class B2 Projector lamp or a 250 watt MBT/U Blended lamp. (The G.S. and Blended lamps give a medium beam spread from 20° to 40° while the Class B2 Projector lamps give a narrow beam from 15° to 20°).

CONSTRUCTION: aluminium. Silvex-finished. Highly specular internal reflecting surfaces. Convex, heat-resisting cover glass sealed to body by rubber gasket. Two feet of three-core T.R.S. cable. ¾" E.T. male thread conduit stem mounting

price 82/6

(6/- extra with coloured glass)

pare glasses *(clear)* 23/6 each
(coloured) 29/6 each

Write for illustrated leaflet to the Advisory Bureau at Creda Works, Blythe Bridge, Staffs, or at 217/9 Tottenham Court Road, London, W.1

made by the house of Simplex

Simplex Electric Company Limited
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S&L

TUBULAR STEEL LIGHTING COLUMNS

Type Gb. 508, 25ft. M.H., for Group 'A' Roads

SUITABLE FOR ELECTRIC LIGHTING

This is one of a series of illustrations indicating our range of standard tubular steel lighting columns, approved by the Council of Industrial Design.
Other designs, plain or fluted, for 13 ft., 15 ft., and 25 ft. mounting heights, will appear from time to time. A folder showing our standard columns will be sent on application.

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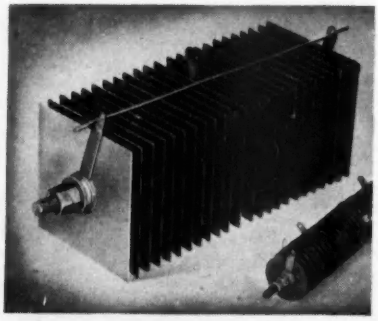
A

Selenium RECTIFIERS

What is your rectifier problem?



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- **COMPLETE RELIABILITY**
- **Or do you require a speedy delivery?**

Whatever your problem, we shall do our utmost to help

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TK31

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CRESSALL Back-of-Board Sliding Rheostat with bevel wheel drive for fine regulation—with Hand-wheel and Dialplate for mounting

Sliding Rheostats *for all purposes*

CRESSALL Sliding Rheostats are manufactured in an immense variety of types and sizes to meet every known requirement. Every CRESSALL rheostat is of sound design and incorporates the best possible workmanship — yet prices are competitive.

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Registered Trade Name of

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Type SPA/B/5/50: 5.0 R.M.S. kA. at 250 volts
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Operating Duty: B—3'—MB.

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(Double Pole)
2,500 amps. at 250 volts A.C.

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The reliability of our electrical equipment is already well known but we take additional pride in the A.S.T.A. Certificates of performance recently obtained, which place Chilton Products in the forefront of specialised electrical equipment

CHILTON ELECTRIC PRODUCTS LTD., HUNGERFORD, BERKS.

THE
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'FIFTY THREE'
PROJECTOR
Superlative when a long light throw plus accurate beam control are required.
Two standard models 500 watt or 1000 watt size. Rimpled or plain parabolic mirror reflectors. Beam divergence range 12° - 40°.
New universal lamp positioning and focussing device. Prices from 180/- each.
Publication 5301 gives full detail.

Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham

TRICITY MEETS the CHALLENGE

Recent survey shows that the electrical industry loses *more than half* of the family cooker business because the average family can only afford between £20 and £30 for a cooker, *including installation.*

What have you for this man

who represents 50% of the buyers of cookers throughout the country? Can you supply him with a family-size cooker for less than £25 INSTALLED?

Yes, you can — with the new Tricity 528. It is designed for use with boiling plate *and* independent oven, or with two boiling plates at will and can be plugged into any 13 amp. socket. That means immediate use as soon as delivered and NO INSTALLATION cost.

Remember too that the Tricity 528 can be easily transformed into a very large cooker — a 'double 528' when required. You *must* have one on show. Results will amaze you!

Here is the full-size streamlined Tricity 528, the new cooker which is converting thousands to Tricity cooking. It's a two-plate cooker with separate grill compartment and independent oven. Vitreous enamel finish *inside* and out. Storage cabinet for pots and pans.

£22 · 16 · 6 *Optional extras: Radiant plate 27/6 Simmerstat 15/6*

Tricity

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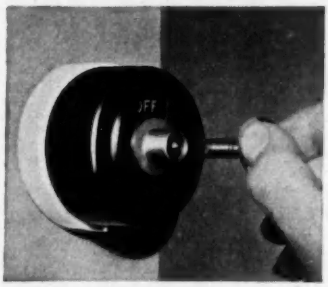
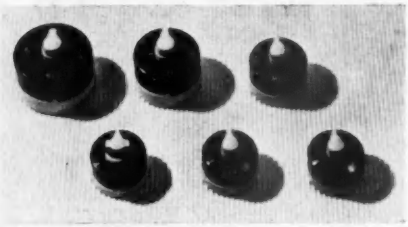
TOK ROTARY SWITCHES *STILL THE BEST*



There are some controls involving Rotary switches where it is desirable that only authorised persons should be able to operate them, and it is now possible to obtain all the TOK *non-reciprocating* switches fitted for key operation.

When you travel by British Railways (Southern Region) remember that TOK switches have been used on all their rolling stock since this section was electrified. The 600 volt Barrier Type has stood the test of time.

YOU can rely on TOK



ELECTRICAL & INDUSTRIAL MECHANISMS LTD
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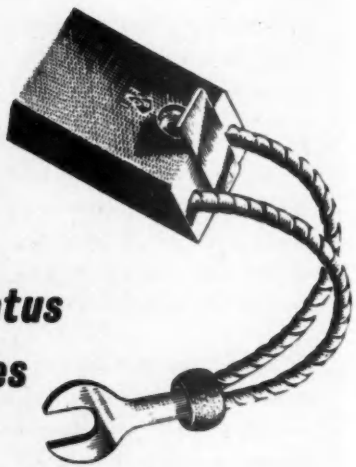
PD **BRUSHES for electrical machines and apparatus of all types**



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Electrical Carbons Division

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You must see the NEW Crompton

"Colourglaze" Lamps

The vivid colouring of the new Crompton "Colourglaze" Lamps is a striking improvement on the old type outside coloured lamps. What is more, this brilliance lasts during the whole of the lamp's life—there is no fading. The new Crompton colour lamps have a hard "polished glass" surface which does not collect dirt and dust and is proof against

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- *Acids*
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- *Sun Fading*
- *Scratches and abrasions*

Available in red, white, blue, green and yellow.
15/25 watts, 200/260 volts.
List Price 1/8d. each, plus Purchase Tax.

Switch to

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BIRMINGHAM 6 ENGLAND

Why be satisfied with 'good-enough'? Higgs range of Geared Units, $\frac{1}{6}$ to 30 H.P., offers the choice of the correct horse-power at the right speed.

The units are made in their entirety at our Witton Works and backed by 40 years' experience in motor manufacture

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Cardiff, Dundee, Glasgow, Leeds, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

DORMAN

TS FUSED SWITCH

- ★ A.C. or D.C.—up to 300 A
- ★ Butt, silver-faced contacts
- ★ Quick double break action
- ★ Mechanism designed to pass Admiralty shock test
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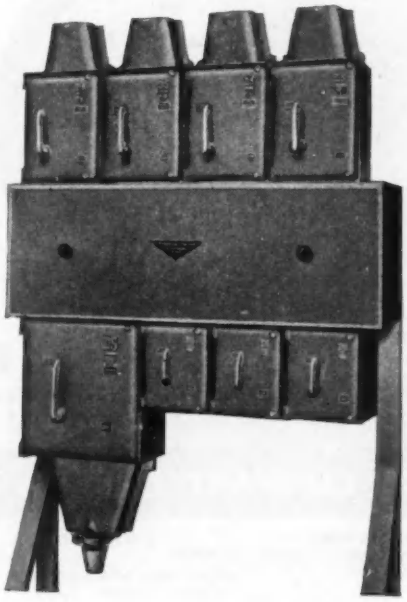
- ★ Space-saving design
- ★ Brass-cased connector fitted if required



THE *NEW* SWITCH . . .

AS MODERN AS TOMORROW

Write for booklet TSS/1 to:—

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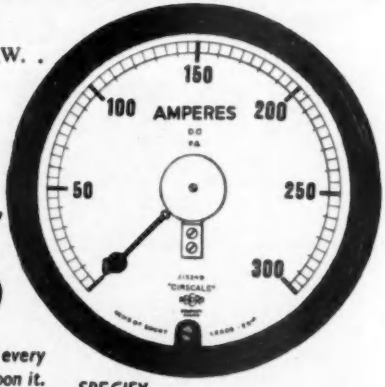
May we humbly remind all our friends who are planning ambitious lighting projects for this splendid year that "the best laid plans of mice and men" . . . unless copper wire of the finest quality is employed for the installations. Symonds H.C. copper wire and strip represents an elementary safety precaution—as some of the largest organisations in the country can testify.

R. H. SYMONDS LTD., 47, Victoria Street, London, S.W.1.

Tel.: ABBey 2771-5. *Works:* Enfield, Middlesex

SCALES THAT KEEP THE LAW. .



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The Finest Electrical Measuring Instruments

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A MOTOR CONTROL BOARD for OUTDOOR installation in Venezuela — comprising D.O.L. Contactor Starter Panels for Motors from 2 h.p. to 60 h.p. Starter panels provided with T.P. Isolating Switch, Back-up Fuse Protection, Stop-Start Push Button Station, visual ON/OFF Indicator and fully interlocked.

All live parts fully screened.
(Also for indoor use.)

Write for Catalogues "Y.1" and "Y.2"

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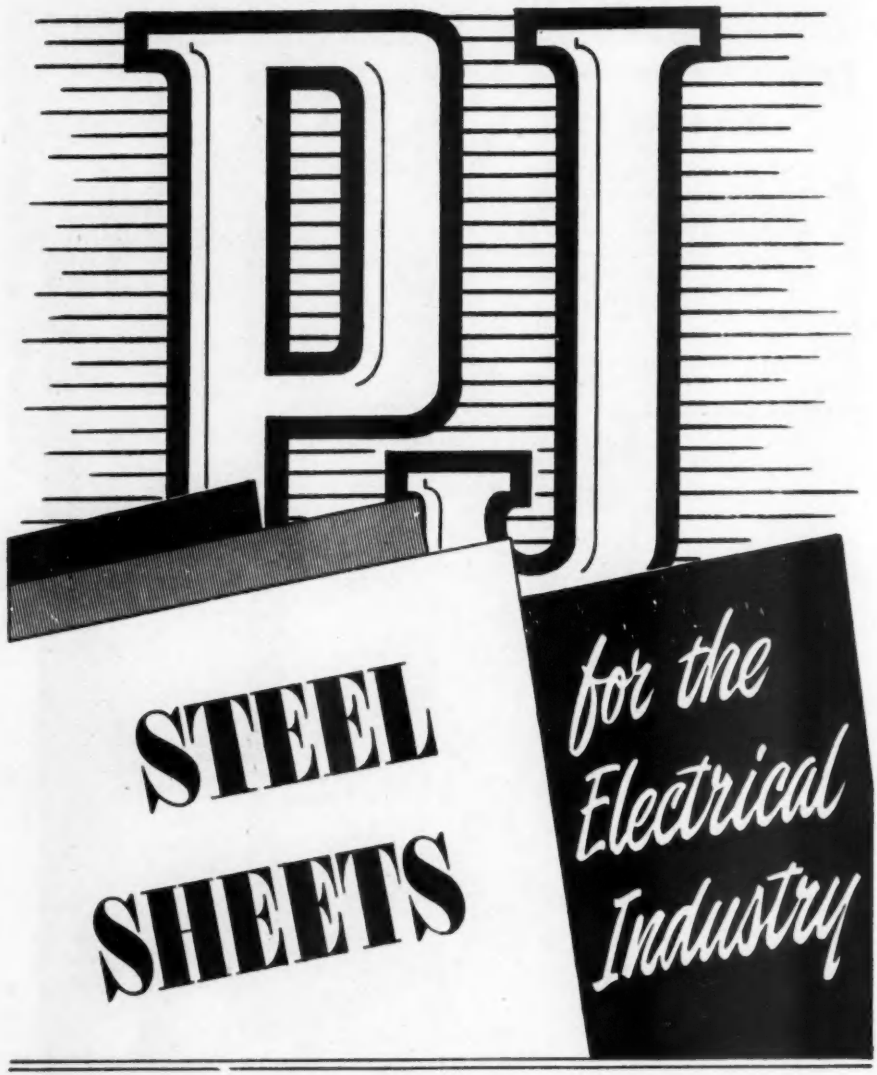

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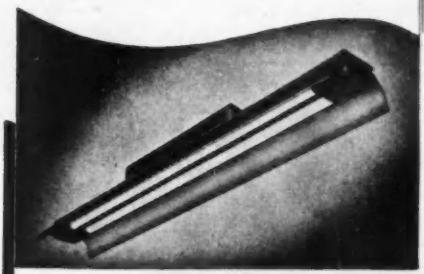
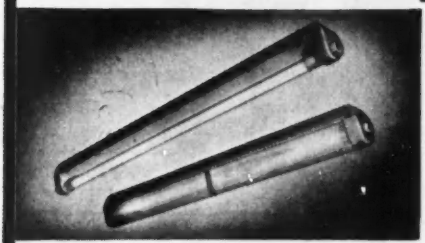


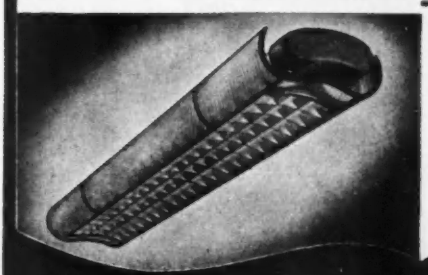
FE/2081.

This ATLAS fitting throws a better light on many industrial problems. And it's able to "stick at it" because of the "Miracoat" finish that defies corrosive atmospheres. It has two 80 watt lamps.



FB/0081.

A cheery fellow this. In its working dress, it is a simple soft 80 watt batten light, throwing out direct and reflected illumination in factories and offices. But clothe it in its diffuser and you have a unit which fits happily into many surroundings.



GN/2040.

No photograph can do justice to the GN/2040, in its decorative diffuser. The downward light from the louvres, the soft glow through the side panels, make it a fountain of light. It carries two 4 ft. 40 watt lamps.

ATLAS 'double-life' TUBES are outstanding for life, performance and colour rendering. Made in all sizes, there are six different "whites" and four colour tubes in the range. Every Atlas tube is guaranteed.

ATLAS

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Lighting Division
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To Grasp

The "Duo-Coil"

THERMOSTATICALLY CONTROLLED

IMMERSION HEATER

- ROBUST TEMPERATURE CONTROL
  non-radio interference
- ONE LOADING FOR ALL SIZES
  range 200/250 volts
- FIXED RATING 2.5 KW AT 240 V
  a.c. only
- LENGTH OF HEATER VARIED BY BENDING JIG
- JUST LOOK AT THE PRICE
  from £3 15s. 3d. plus P.T.
- AND THIS *INCLUDES*
  THE ADJUSTABLE THERMOSTAT

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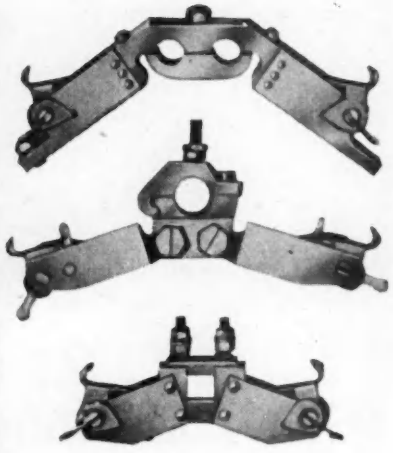

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SYNTHETIC CARBON & ENG. CO. LTD.
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FLUORESCENT LIGHTING

Length 65⅛"
Depth (including lampholders) 4¾"
Width 4⅛"
Fixing Centres 24"

BATTEN FITTINGS

Built to last · Easily erected · Fixed type B.C. lampholders · Bonderised · Glossy white stoving lacquered finish · No troublesome hum ·

PRICE
with switch start gear
110/-
(Tube extra)

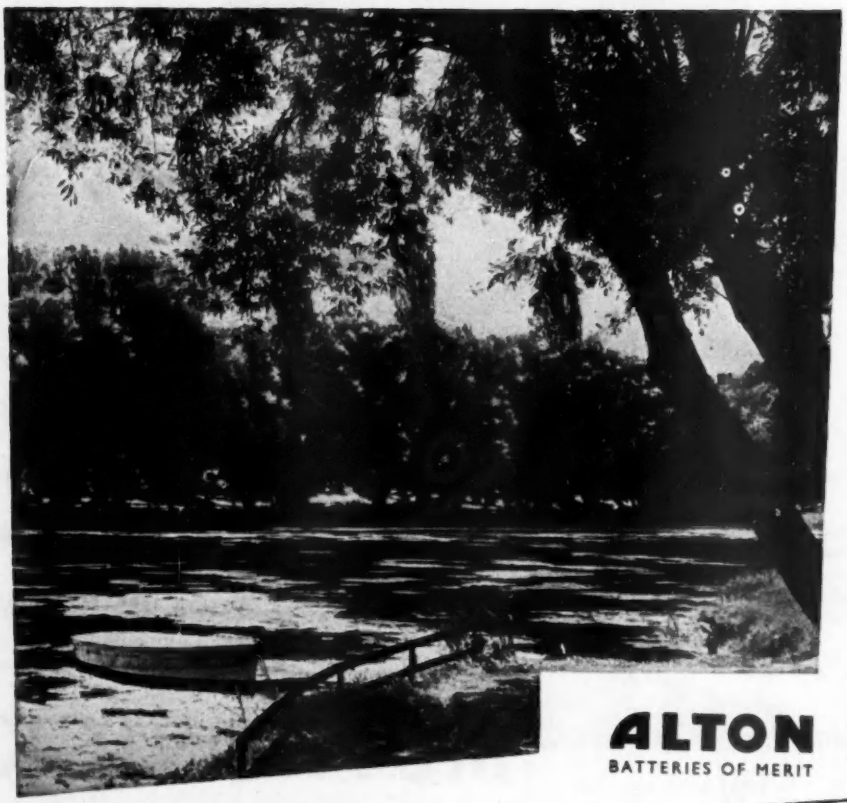
METROVICK

METROPOLITAN-VICKERS ELECTRICAL CO. LTD. ST. PAULS CORNER, 1-3 ST. PAULS CHURCHYARD, LONDON, E.C.4
Member of the A.E.I. group of Companies

5/F301

This is King's pond—and its waters almost lap the bricks of the Alton Battery Works' south-west wall. It is part of the Company's property—a 5-acre asset in real estate. And a symbol of assets in wider terms than accountancy covers.

Alton is a country town—with a full, rounded, contented life of its own. A town where people have not yet changed to personnel. A town where families take root—and son follows father up to the Battery Works. A place where a man's proper pride in himself and his folk and the life he leads is reflected in doing things just that all-important bit better than 'up-to-specification.' And Alton batteries are made by Alton men.



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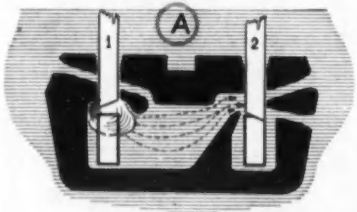
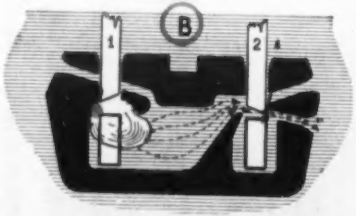
THE CATON *ArcTrap* CIRCUIT BREAKER

In service and full production from
250 MVA 6.6 kV to 500 MVA 22 kV

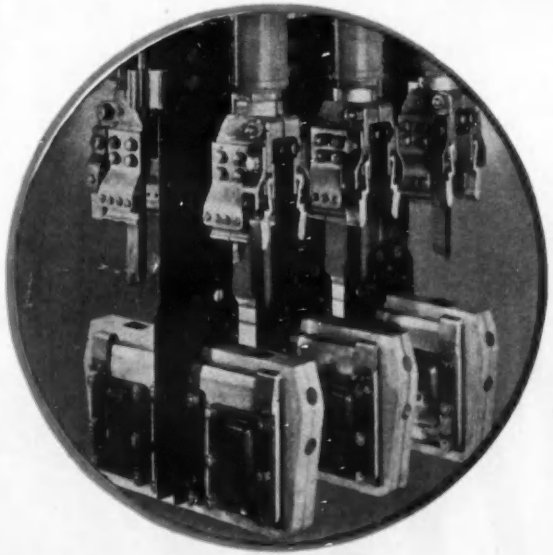
A REVOLUTION IN CIRCUIT BREAKING TECHNIQUE *ArcTrap*



No. 1. Electrode Leads by ½ cycle. Pressure trapped except for constricted relief at No. 2 in advance of arc.

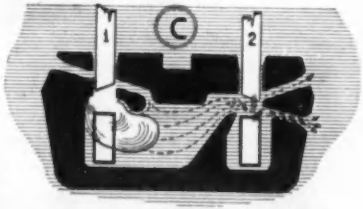


No.2. Electrode breaks contact. Arcing restricted and displaced by pressure.

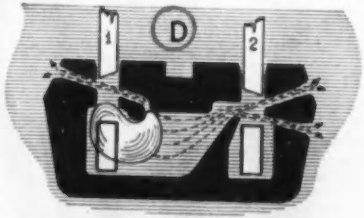


British and Foreign Patents pending

EQUAL RESPONSE AT ALL CURRENTS.



Arc severed at current zero by high pressure clean oil.



Arc trap scoured by exhausting pressure and rapidly refilled with clean oil.

FULLY TESTED AND CERTIFIED.

YORKSHIRE SWITCHGEAR & ENGINEERING CO., LTD.

LEEDS LONDON

why pick on us?

Why? Well . . . can you imagine making something as complicated as this electric fan louvre *in one operation* by any other method than pressure die casting?

the whole in one

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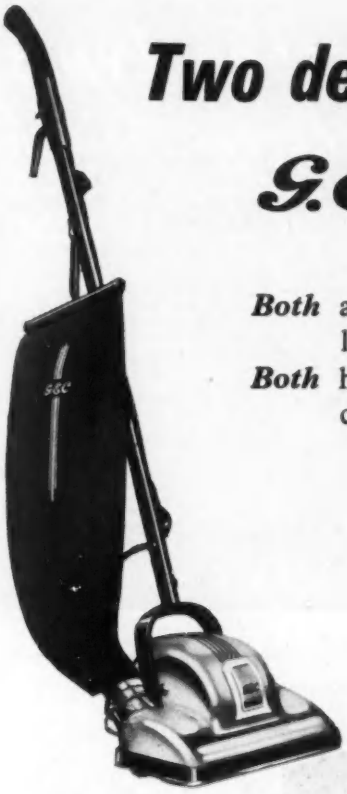
Two dependable G.E.C. Cleaners



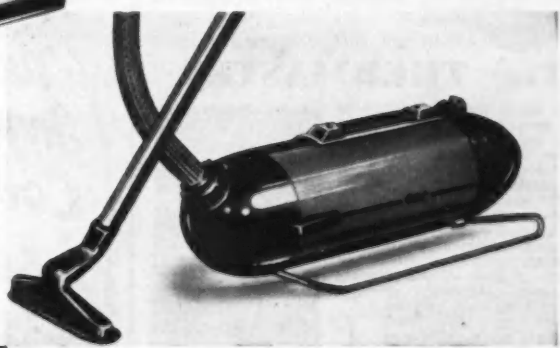
Both are perfectly engineered for full and long service.

Both have motors resiliently mounted and completely enclosed.

Upright model DM 370

- Automatic adjustment of carpet nozzle for varying thicknesses of carpet pile. Power driven revolving brush removes embedded particles, threads, hairs, etc.
- Hard-wearing dust-bag, with large opening to facilitate emptying and sleeve to prevent dust falling out when bag is detached.

£22.18.10 including tax. Attachments extra, if required. £5.1.0 including tax.



Cylinder model DM 310

- Light in weight, with chromium plated skids giving extreme manœuvrability.
- Extremely simple and swift fitting for all attachments. Foot operated switch.

£20.1.6 including tax and complete set of attachments.

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THE GENERAL ELECTRIC CO. LTD, MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

SIFAM Precision INSTRUMENTS

A New Low Temperature Indicator

The THERMASTER

The most versatile instrument for temperature measurement in the range −80° to +200° C. Easy detection of changes to within ½°, instant response; self contained with small dry battery; readings unaffected by voltage change. Pencil type "Thermo-Detector" for surface contact, immersion, air or liquid temperatures; supplied with any length of leads without affecting accuracy. Accuracy ± 1%. Scale 8 in. long, can be scaled for any intermediate range, minimum 20° C.

From **£12-10-0**

Complete with one element and 4-ft. leads.

For details of this and other SIFAM instruments, write for catalogue No. S.13.

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New... Yes
Ingenious... Very
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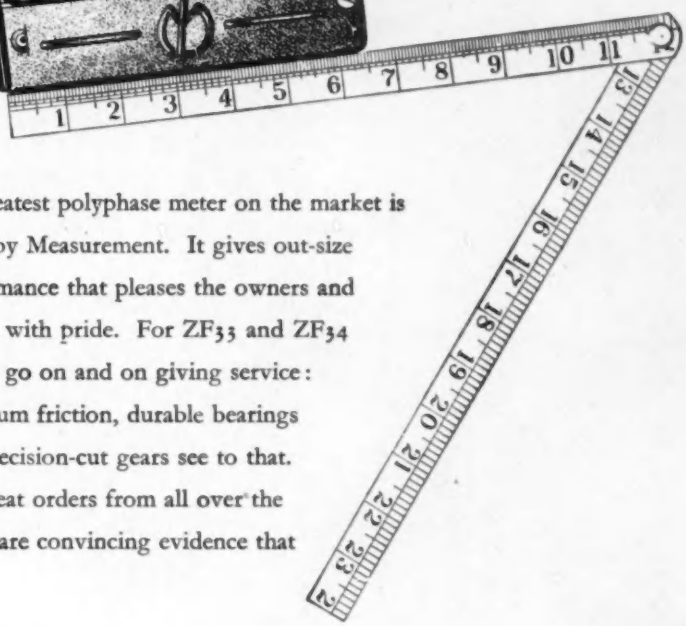

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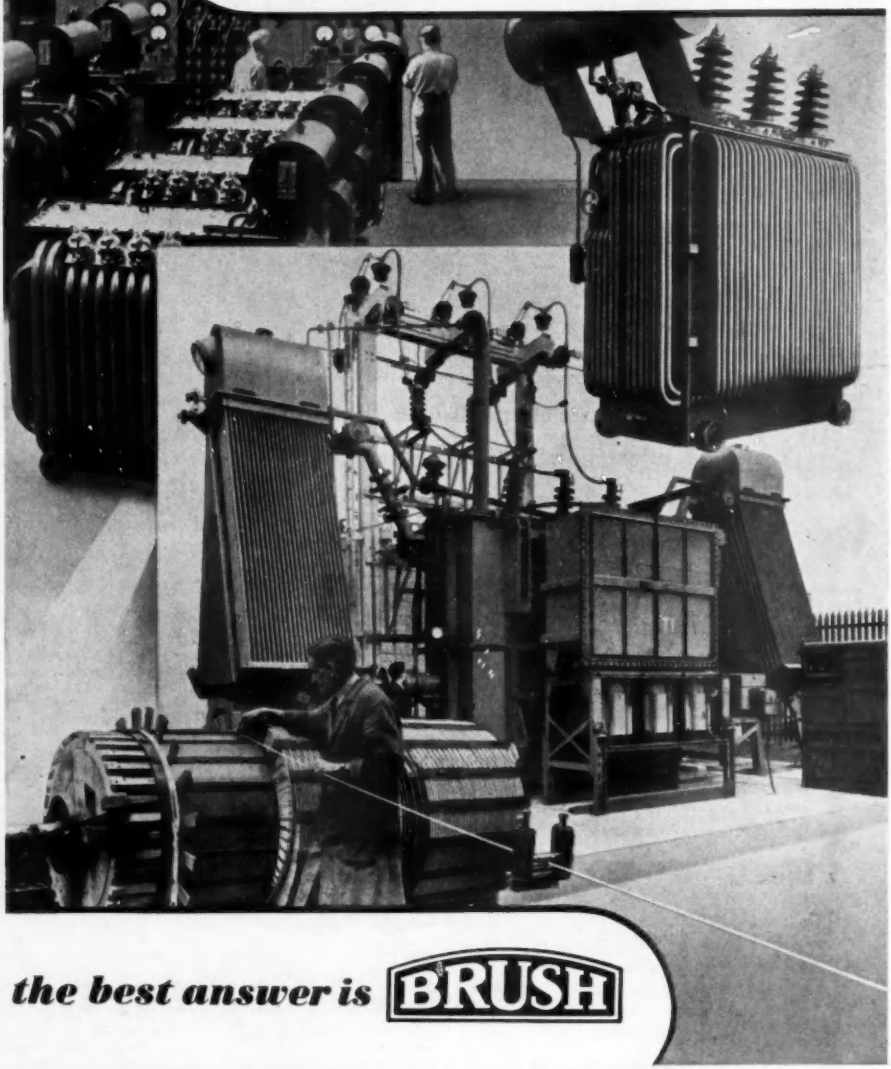

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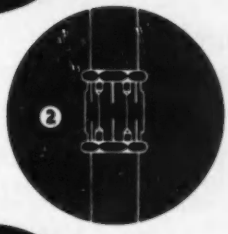

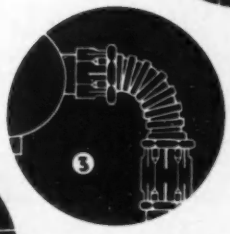

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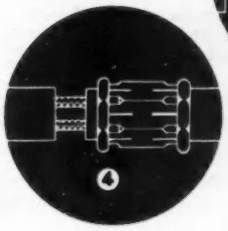
Tightening of the taper-threaded nut tightly contracts the slotted end of the ABCON fitting on to the conduit.



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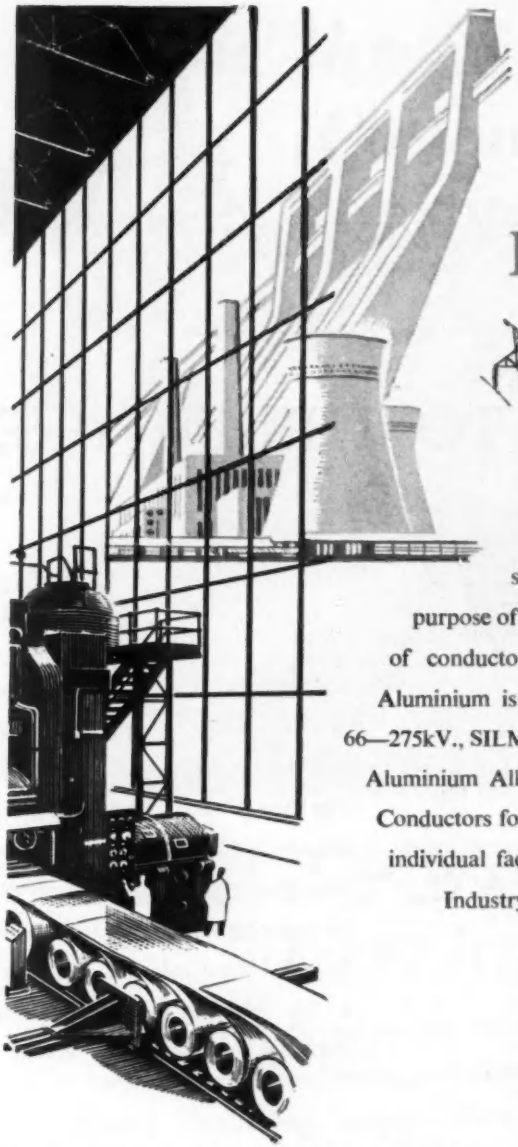

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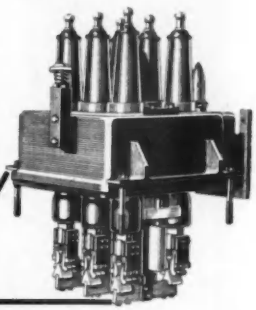

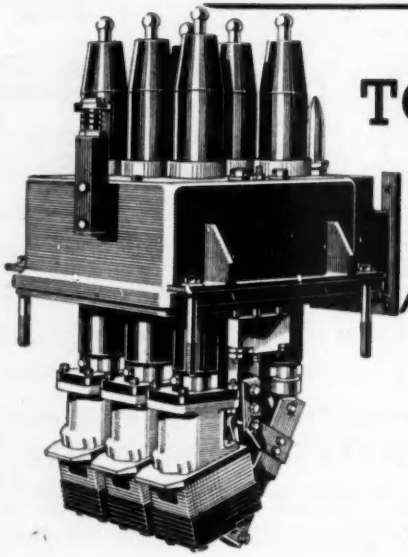

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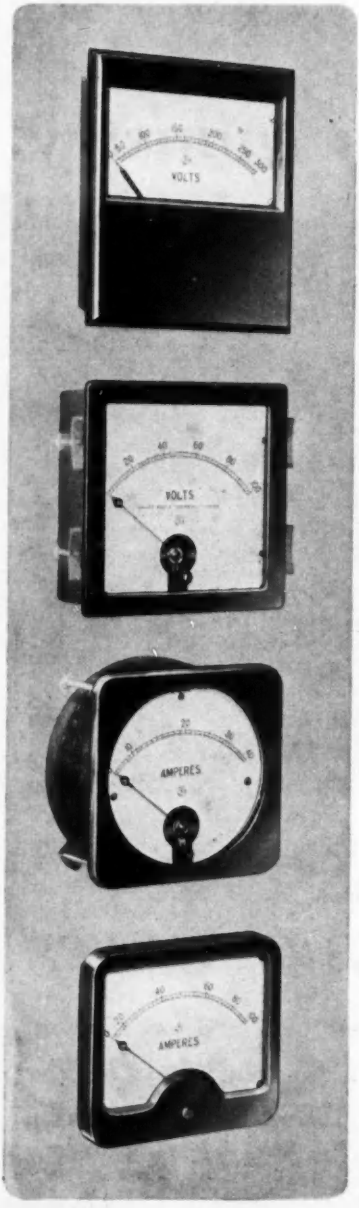

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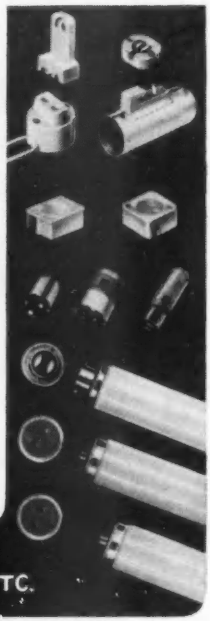

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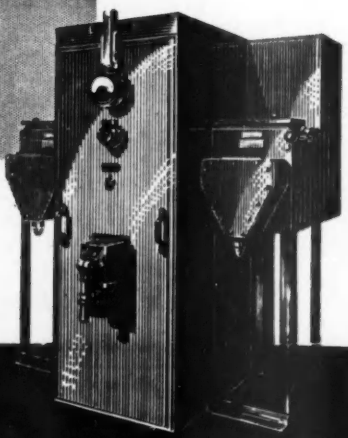

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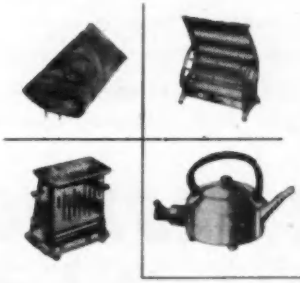

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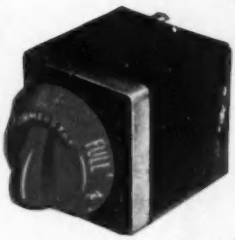

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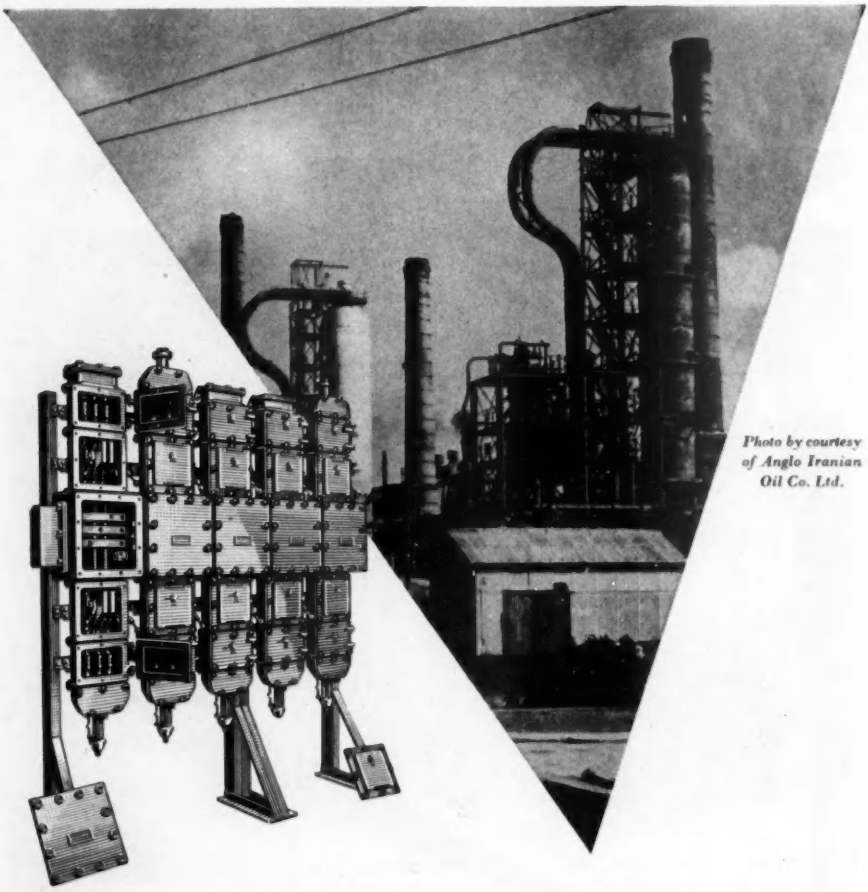

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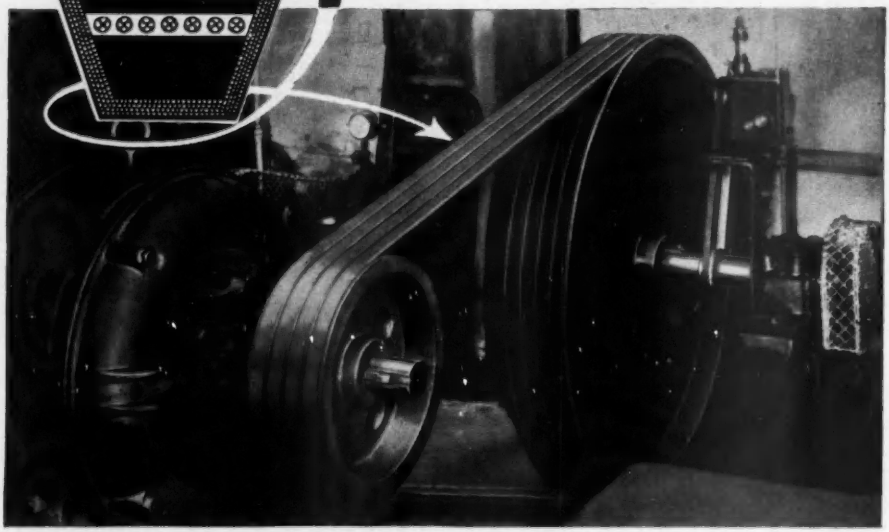

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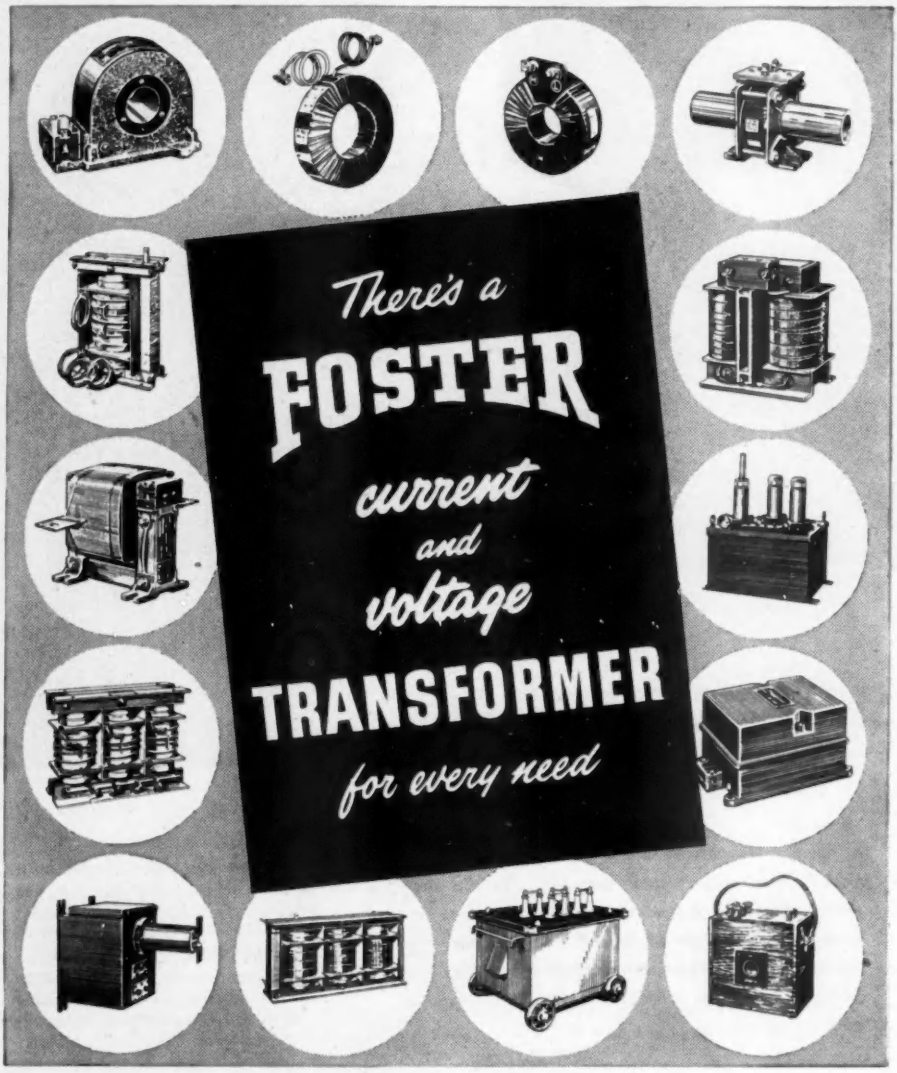

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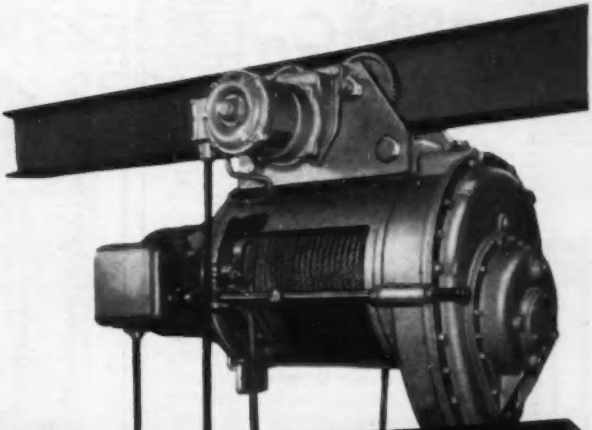

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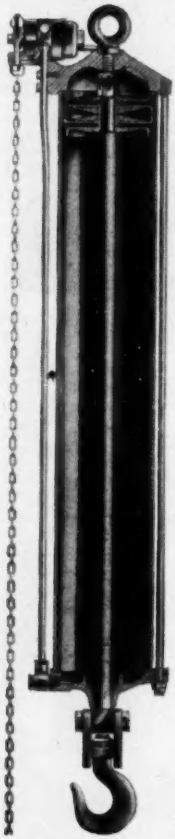

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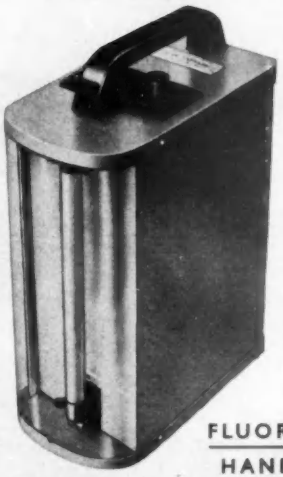

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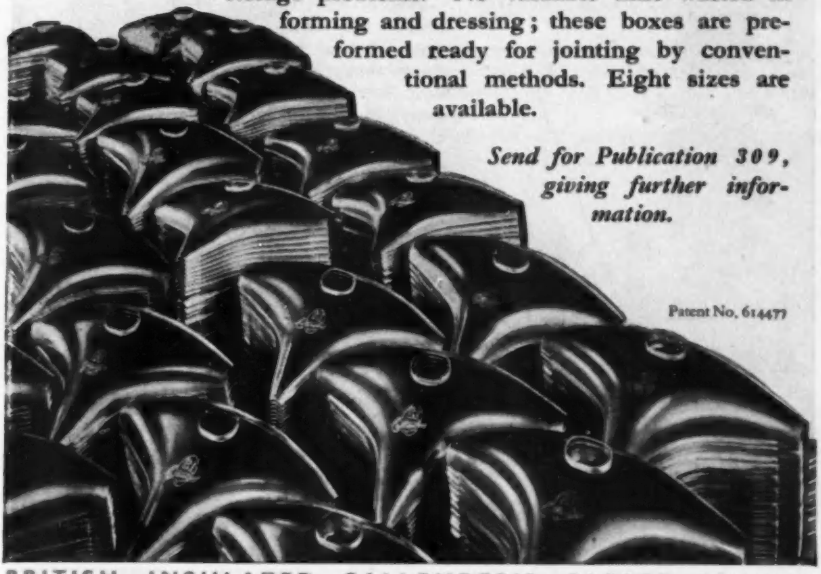

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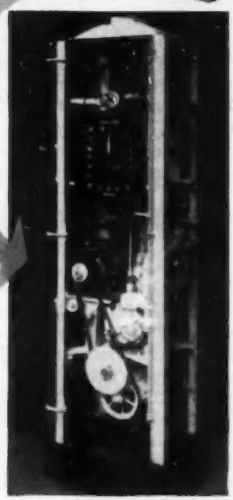
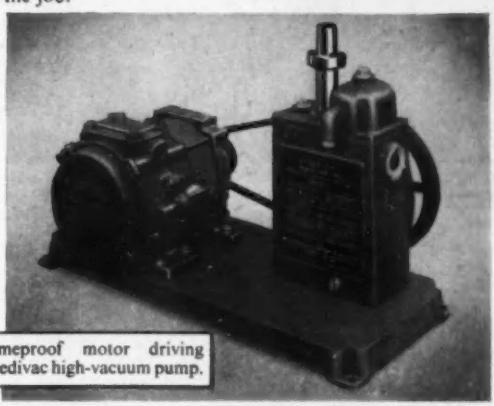


Kerbside Petrol pump (covers removed)



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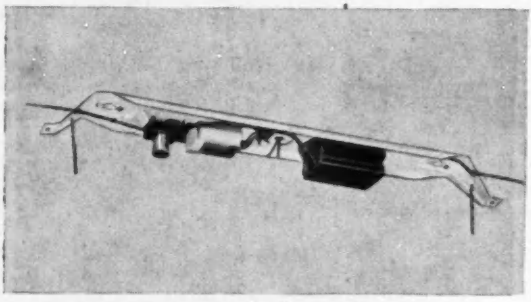

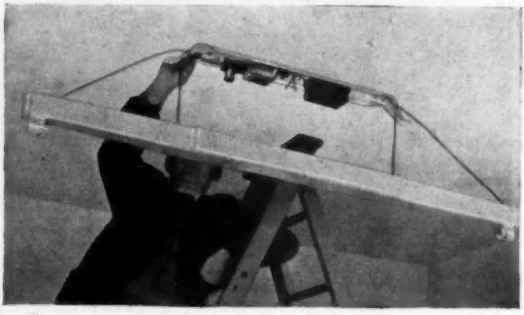

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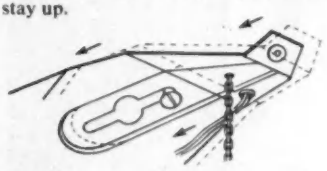
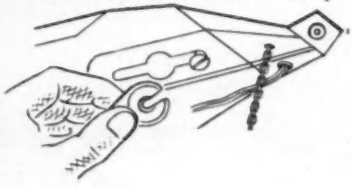
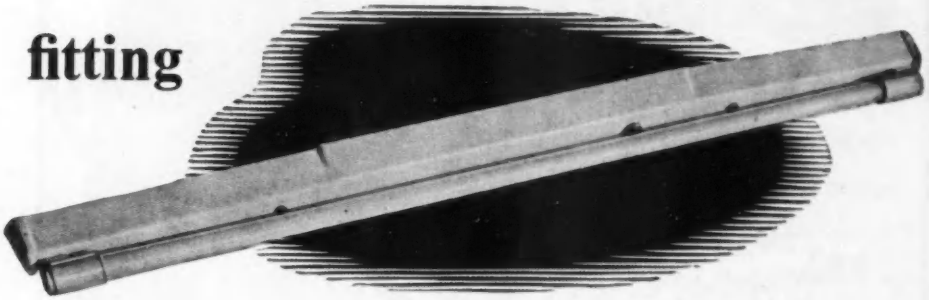


THEN, slide "Pendicone" washers over heads of C/S screws. Move gear tray until screw heads and "Pendicone" washers are central to the ⅛" holes of key slots. Tighten screws. Connect supply wires to terminal block provided and secure channel to gear tray by means of two captive screws at underside of channel. Note: The earth terminal MUST be used for Instant Start Lamp.



"UNILUX" single lamp 80 watt fitting



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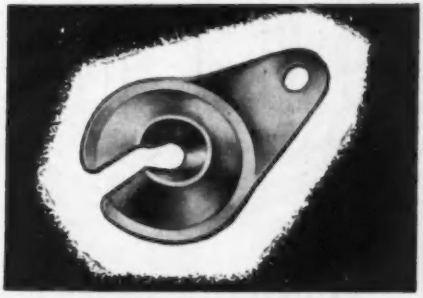

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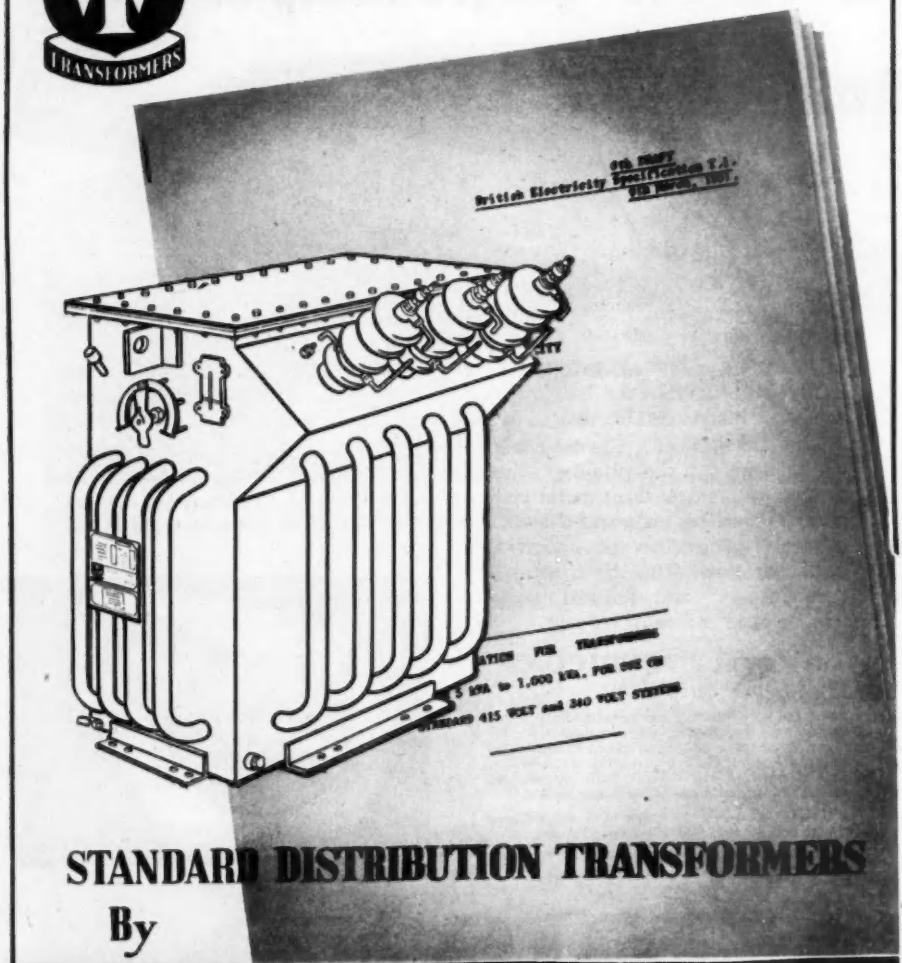

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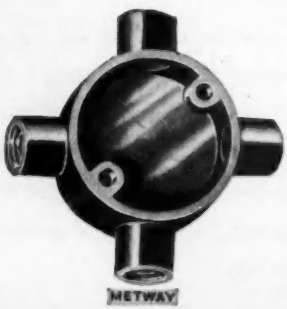

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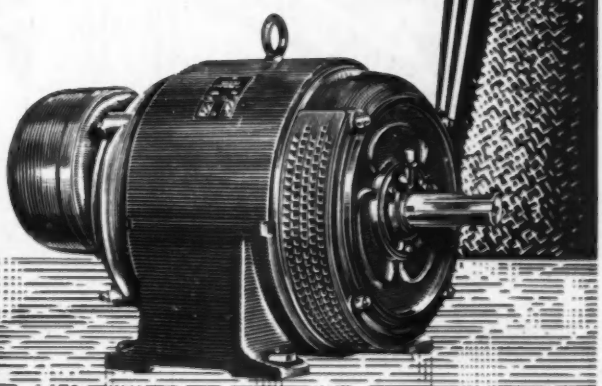

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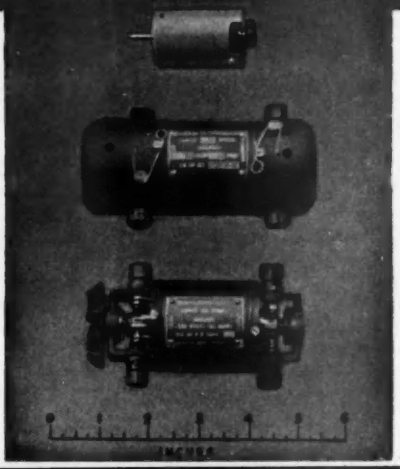

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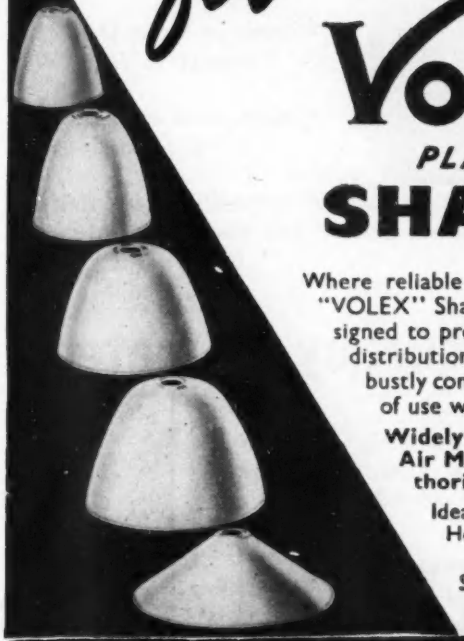

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Editorial

ADVANCE IN NUCLEONICS

ATOMIC energy for non-military purposes is receiving increasing attention, and the two statements on the subject made to Parliament last week are likely to make the pace grow faster. Of these, the announcement that the construction of an atomic power station is to be started at once occasioned little surprise, though it is none the less welcome for that. Secondly, the decision that responsibility for atomic energy work as a whole is to be transferred from the Ministry of Supply to some outside organisation was less commonly expected and, until more information is forthcoming about the type of organisation the Government has in mind, it will be difficult to see what this move holds for industry. It is probably significant, however, that a year ago the Controller of Atomic Energy told investigating Members of Parliament that the Ministry was beginning to consider methods by which the resources of private industry could be incorporated in atomic energy work. Presumably an increasing amount of development work will be handed to large industrial concerns, while the Government, through its new controlling body, maintains direct charge of establishments processing uranium and producing fission materials. It is noteworthy in this respect that there is no contemplation of reliance on private capital for such work: the Government apparently expects to continue to finance most of the cost of nuclear investigation and manufacture. The proposed change may have considerable advantages, however, in allowing plant designers to have a closer look at the possibilities of nuclear methods.

FACTS FOR THE FARMER

FARM electrification seems to be universally desired, but not so commonly afforded. Unless the farmer uses his supply on the farm as well as in the home, the return to the supply authority is seldom enough to justify the necessary capital expenditure, and if the farmer is asked to buy or rent supply lines, he pleads inability to stand the cost. Increase in farm loads provides the only way out of this dilemma, and it is up to the electricity industry to show the farmer how a greater use of electrical energy can be to his advantage. In the forefront, here, is the Rural Electrification Section of the E.R.A., and it has been pleasant to see, during its present open days at the Shinfield Station, the wide front on which it is attacking this question of the farmers' need. An important feature of the display has been a plan for a farm of the future, with the accent on economical labour-saving. But is a plan enough? Since farmers must be persuaded that electricity can help them, and that they can afford it, the most satisfactory way of bringing this home to them is by fully electrified demonstration farms in rural areas, where practically-minded farmers can see for themselves, under field conditions, that complete electrification of farms is not only a paying proposition but one that is essential to the nation's welfare.

SUPPLY IN THE FUTURE

NO organisation can survive as a rigid entity, least of all those boards set up in the post-war orgy of nationalisation. Experience is now showing weaknesses of the hasty legislation and of the initial organisational structures built on paper. In consequence, our nationalised boards have been coming under fire from economists seeking a convenient target for study. An examination of the problems that goes deeper than most we have read is to be found in the recently published book, *The Future of Nationalisation*. Not all will agree with the authors' findings, but their plea for a return of the Electricity Commission

will find an echo amongst many in the industry, and the advocacy of autonomy for area boards appears to line up well with post-1947 thought. Such steps, however, would require legislation and no one wishes to see another widespread upheaval of the industry, least of all if the alternatives offered bring with them their own difficulties. The only satisfactory course is for the industry to find its own solutions to the problems with which it is beset, and the way to this is clearly through cautious experiment. Already certain changes are being made, as with the adoption of a two-tier structure by certain boards, and no doubt the next decade will bring a continued evolution towards a better structure for our industry.

BOILER AVAILABILITY

THE recent issue of four more reports of the Boiler Availability Committee serves to emphasise the excellent work which has been done by this body since its inception in the early days of the War. In addition, however, to the wealth of scientific information which has been accumulated on the mechanics, physics and chemistry of deposit formation, the Committee has been markedly successful in overcoming specific cases of bad fouling and corrosion of boilers at several power stations. There still remains, however, much work to be done, particularly with regard to the effects of the chlorine content of coal. As one of the reports points out, severe deposit troubles experienced at Burton, using high chlorine fuels, had not been found at Acton Lane where the same fuel was being burnt, and the reason for this is now under investigation. Such an apparent anomaly serves to underline the peculiar difficulties attendant on research into boiler availability. Yet these difficulties must be overcome if the best is to be obtained from new highly stressed plant now coming into commission.

MEASUREMENT IN MASS

THE supply engineer knows surprisingly little about the demand characteristics of his customers as individuals; his measurements are concentrated on behaviour in mass. Thus when problems arise demanding a knowledge of how the average householder uses his supply, the smoothing action of diversity is found so to have blurred the outline that available mass results are useless for the purpose. To fill this lacuna in the basic data on which planning must be based, a group of engineers have been perfecting and extending for some years the art of statistical sampling in relation to electricity consumers. Their most recent results, published last week in an I.E.E. paper, provide a good example of the usefulness of their work. This particular survey extends knowledge of the total consumption of the individual consumer to take account of the spread between high and low rates of use, with all that can mean in terms of rating for various instruments and appliances.

ECONOMIC METERING

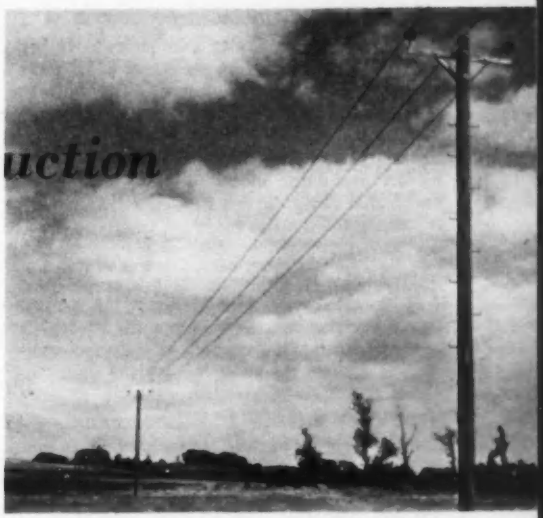
THE particular problem which set afoot this inquiry was that of economic metering. Since meters tend, in general, to read slow with increasing age, they must be tested at suitable intervals if the supply authority is to avoid loss of revenue. Apart from statutory requirements, such testing is relatively expensive, and its cost must be balanced against prospective metering loss. The key question is, how much energy is used at different power levels? In providing the answer that consumers take a surprisingly high proportion of their demand at low rates, the investigation has laid a new emphasis on the need to avoid over-metering, which can prove doubly uneconomic. Overload capacity of meters must be used to the full. Yet a warning is necessary: the industry is working to increase domestic consumption as another necessary factor in keeping down prices, and a realistic meter policy must allow for this hoped-for growth in individual demands. The authors of this valuable paper show that they are aware of this factor: it is important that others who will use their results realise it equally as clearly.

Meteor

Overhead Line Construction

The choice of conductors, the choice of span and the design of cross-arms for wood pole lines are described by a contributor

Part One



An 11 kV line to B.S.S. 1320 with Silmalec (Aluminium Wire and Cable Co.)

THE materials most commonly employed for overhead line conductors are copper, cadmium copper, and steel-cored aluminium. Steel-cored copper and pure aluminium are also used, the latter increasingly for m.v. lines; while "Silmalec"—an alloy of aluminium—is evoking considerable interest at present. Galvanised steel strand is also sometimes used for lines which are very lightly loaded. Less common though occasionally used for special purposes, such as abnormally long spans, is phosphor bronze strand.

On account of its high cost copper is in danger of losing its long held position as the favourite material for line conductors. A combination of high cost and scarcity having compelled engineers to look elsewhere, it is doubtful whether increased supplies unaccompanied by considerably lower prices will serve to regain the lost ground.

Steel-cored Aluminium

This conductor, covered by B.S.S. 215, became popular in the early days of "The Grid," but has suffered somewhat from troubles resulting from a lack of knowledge and understanding of its characteristics, which caused earlier users to try to win too great an advantage from its low weight and high tensile strength. In consequence, severe vibration troubles were experienced and, although it is now known that provided vibration dampers are fitted or the tension is kept within certain limits at normal temperatures no trouble need be anticipated, it fell into some disrepute and has not completely regained the confidence of all potential users. Furthermore trouble experienced due to the corrosion of the galvanised steel core, both on "S.C.A." and steel-cored copper conductors, has caused some engineers to look askance at composite conductors.

In this connection it should be stated that while earlier attempts to protect the core by a bituminous coating met with indifferent success, producers have now evolved a high melting point grease protection which, it is claimed, is highly effective, even in tropical countries.

Steel-cored aluminium is seldom used on wood-pole lines. The spans are not usually long enough to permit much advantage to be gained from the small sag.

Cadmium Copper

This conductor, which is covered by B.S.S. 672, is regarded as practically interchangeable with S.C.A. Its maximum sag is rather less than that of an equivalent S.C.A. conductor up to about 0·1 sq. in. copper equivalent. Vibration trouble may also be encountered with this conductor unless its tension at normal temperatures is correctly regulated. This characteristic is common to *all* conductor materials but is more likely to become a limiting factor in the tensioning of high-tensile conductors.

Cadmium copper suffers from the same disadvantage as ordinary H.D. copper—its high cost.

Plain H.D. Aluminium

Hard drawn aluminium conductors (together with S.C.A.) are covered by B.S.S. 215. They are being widely used for medium voltage lines. Owing, however, to low tensile strength and large diameter (compared with copper of equivalent sections) this material is less suitable for h.v. and e.h.v. lines with their longer spans and higher tensions. It is here that "Silmalec" is gaining popularity.

"Silmalec"

This alloy of aluminium, which contains 0·5% magnesium and 0·5% silicon, has a much lower weight than copper and its tensile strength is greater than that of a copper conductor having the same equivalent area. In consequence its tension/weight ratio is more than double that of H.D. copper.

A Silmalec conductor has, however, a considerably larger diameter than a copper one of equivalent area and this results in placing a much increased stress on supports due to the windload on the conductors. (The same, of course, is true of S.C.A. conductors and to a slightly greater extent). For this reason on wood-pole lines it is not practicable to take full advantage of the small sags by developing longer spans. Even if spans are kept the same length as would normally be used for copper, poles on the larger section lines (0·1 sq in., for instance) are likely to need their sizes increased above the normal "stout" range. On such spans—of the order of 350 ft to 400 ft little advantage can result from the decreased pole heights as the sag difference for Silmalec and copper is only about one foot. On these lines, therefore, the appeal of Silmalec depends almost entirely upon its much lower cost. The fact that it could be erected to have the same sag as copper and a higher factor of safety might be considered a further point in its favour.

In using Silmalec it is important to appreciate certain limitations which this material imposes. For the shorter span lines—almost all wood-pole lines for instance—the erection tension will be determined not by the ultimate strength of the conductor and the maximum assumed loading, but by the need to ensure that the "every day" tension (taken as that in still air at 40° F.) does not exceed about 20-25% of the ultimate strength. If the "every day" tension exceeds this figure trouble due to vibration—resulting in fatigue fracture of strands at clamps or binders—is likely to occur. As an alternative to reducing the working tension vibration dampers or "armour rods" may be fitted. This alternative is unlikely to be an economical one on lines with short spans as the reduction in sag due to the higher tension would not pay for the additional fittings.

Vibration

As pointed out earlier, this tendency to vibration is exhibited by all "high tensile" conductors and indeed it is recommended that even H.D. copper conductors (in common with cadmium-copper) should not be erected so that the tension at 60° F. exceeds about 30% of the ultimate strength. The reason for basing calculations on 40° F. for aluminium and its alloys and on 60° F. for copper and its alloys is obscure! This limit of 30% at 60° F. would correspond roughly to 34-35% at 40° F. and rarely operates as a limiting factor for H.D. copper lines. It will be found, however, that while it only affects lines having an equivalent span of less than 150 ft for 0·05 sq in. copper and less than 300 ft for 0·1 sq in. copper, equivalent spans below 400 ft will be effected on 0·15 sq in. copper lines. Fig. 1 shows portions of tension charts, for 0·1 sq in. H.D. copper and for 0·1 sq in. equivalent Silmalec. The present writer has yet to hear of vibration trouble being experienced on H.D. copper lines, although such lines have long been erected at tensions based on 50% of the ultimate strength under wind and ice loading at 22° F.

Uplift

To return to the consideration of Silmalec, another limitation, and probably a more serious one, particularly for lines with comparatively short spans over broken country, is its very flat "uplift" curve. When conductors are carried on pin insulators it is usual to prohibit "uplift" by an unloaded conductor in still air at 22° F. When suspension insulators are used, it is necessary to ensure that the vertical load at the suspension clamp is under all conditions sufficient to prevent excessive insulator swing. To this end a weight is sometimes attached to the clamp.

The need to avoid "uplift" can result in many supports having to be higher than the demands of ground clearance require. In some cases an alternative to the use of a tall support may be the introduction of a section point, at which "uplift" is permitted. Whether this alternative is an economic one will depend upon the type of line and the number of intermediate supports of which the heights are affected. It may therefore be necessary to investigate the costs of alternative arrangements.

Bi-Metallic Action

It should scarcely be necessary to mention that where aluminium or one of its alloys is used, special precautions are necessary at junctions with copper lines or fittings—including, of course, copper alloys. As is well known, copper and aluminium junctions will suffer from electrolytic action in the presence of moisture.

It is also important that tools used for erecting copper lines should not be used in the erection of aluminium conductors as minute particles of copper will be transferred to the aluminium where they will give rise to corrosion.

Galvanised Steel Conductors

Galvanised steel strand has been widely used as a continuous earth wire, and is also used to some extent as a conductor on lightly loaded h.t. lines in rural areas.

In a paper on Rural Electrification[1] which appeared in 1946 the authors stated that they were using 7/14 s.w.g. galvanised steel strand of 60-ton quality. This strand had been given a bituminous coating after stranding, and had at that time been in use for over 13 years in situations near the coast.

The use of a bituminous coating is interesting. In certain localities much trouble can be experienced from the rusting of galvanised steel strand. Cases have occurred where an underrunning g.s. earth wire has tightened up as a result of the "growth" of wires and reduced the clearance to the phase conductors. It is probable that the worst cases of corrosion occur, not near the coast, but in polluted industrial atmospheres.

Unfortunately the above paper gives no information regarding the electrical properties of the galvanised steel strand, nor does it state the value of the current which it is expected to carry. Since galvanised steel strand is most generally used as stay wire, information regarding its mechanical properties is readily available, but it is unusual to find any reference to its electrical properties.

No doubt one reason for this reticence is the fact that both its resistance and its reactance vary not only with current but also with frequency. The result of a very interesting investigation of these matters was published in 1928[2]. Since, however, this was prior to the publication of B.S.S. 183, the investigation did not cover strand to that specification, though probably the results would be valid for strand of 45-ton quality, since strand of this tensile strength was included.

Incidentally it may be noted that 60 ton quality strand is not covered by B.S.S. 183, which is for 31-ton, 45-ton and 70-ton grades.

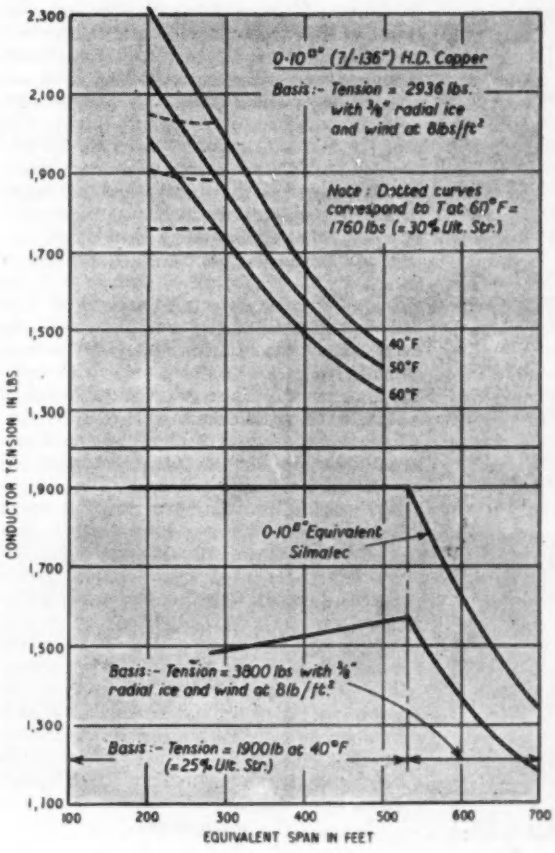


Fig. 1. Portion of tension charts for 0·1 sq in. H.D. copper and 0·1 sq in. equivalent Silmalec

Choice of Span

Having decided upon the type and size of conductor to be used, suitable span lengths can be selected.

If steel towers are used the choice of span will be dictated by the economic balance between long spans with correspondingly tall towers and shorter spans with shorter towers. Since conductor cost is independent of the number or height of the supports it need not enter into the calculations. Before, however, the design of the supports can be settled, questions of conductor spacing and formation must be decided. The choice will probably be limited to a number of "standard" designs.

Various formulae exist for calculating conductor spacing; all are empirical. A selection from these is :

$$(1)\quad S = 0{\cdot}01V + 1{\cdot}24\frac{d}{w}\sqrt{D}$$

$$(2)\quad S = \frac{V^2}{6100} + 1{\cdot}36\sqrt{D}$$

$$(3)\quad S = 2D_1 \sin\theta$$

where S = conductor spacing in feet.
V = voltage in kV.
d = conductor diameter in inches.
w = conductor weight per foot.
D = conductor sag in feet.
D_1 = conductor sag with ice load, in feet.
θ = angle of conductor swing for ice loaded conductor under a 30 m.p.h. wind (wind pressure 2·88 lbs/ft².)

Formula No. 2 is the well-known Verbandes Deutscher Electroteknischer formula converted to British units, while formula No. 3 is due to Dr. J. D. McCoombe.

It will be noted that while formulae 1 and 2 make the spacing vary in a linear manner with the square-root of the sag, and thus vary in the same way with the span length, formula 3 employs the first power of the sag. The latter relationship certainly seems more logical, though the absence of a constant term might be questioned.

It appears that all suggested formulae give unnecessarily large conductor spacing for very long spans. This may be the reason why—in the face of logic—formulae involving $\sqrt{D}$ have been proposed.

TABLE I—CONDUCTOR SPACING FROM DIFFERENT FORMULAE

Copper Conductor	Span	Formula 1		Formula 2		Formula 3
		11 kV	33 kV	11 kV	33 kV	—
0·025 sq in.	250	5·78	6·0	2·8	2·96	—
	300	6·92	7·14	3·35	3·51	—
	350	7·97	8·19	3·85	4·01	—
0·05 sq in.	350	4·20	4·42	3·51	3·67	—
	400	4·73	4·95	3·97	4·13	—
	500	5·85	6·07	4·95	5·11	—
0·1 sq in.	350	3·05	3·27	3·16	3·32	3.42
	400	3·49	3·71	3·61	3·77	4·55
	500	4·35	4·57	4·55	4·71	7·28

As might be supposed widely different results are obtained from the use of the three formulae quoted (see Table I). For further discussion of these matters interested readers are referred to certain publications listed in the bibliography. ([3], [4], [5]).

For single circuit lines there is much to be said for conductors in horizontal formation. This greatly reduces the risk of conductor clashing under unequal ice loading. Horizontal formation seems particularly applicable to wood-pole lines, whether single pole or "H" (or portal) types.

Economics

Having decided these matters of conductor formation and spacing and determined upon a general structure design, prices for supports of various heights (erected complete with insulators and fittings) may be obtained. The span which supports of each height will accommodate so as to provide adequate clearance over level ground, can be determined, and the approximate number of supports per mile computed for each support height. The cost per mile of supports—assuming all supports to be of the same height—for each height of support can now be found and this figure should be plotted either against support height or against the corresponding span length.

It will be found that the lower portion of such a curve will be fairly flat, so that the choice of span length is not very critical. It is desirable if possible, in computing costs, to make some allowance for such items as crop damage—in so far as this is dependent upon the number of supports. The difficulty of making such an allowance, however, is considerable, and in view of this it will be understood that too nice an appreciation of the economic aspect cannot be made.

As previously mentioned this economic investigation is more appropriate to lines carried on steel towers, though H pole or portal lines, where spans are long and supports costly, may also require an investigation of this sort.

Where such an investigation is made, the span which corresponds to the least cost per mile will be chosen as the normal span—or perhaps more correctly the nearest corresponding standard size of support will be the normal support, higher, and perhaps also lower, supports being required at certain locations depending upon the ground levels.

(To be concluded)

Report from Castle Bromwich

MOST MANUFACTURERS OPTIMISTIC ABOUT THE NUMBER OF ENQUIRIES —BUT BUYING IS LESS

AFTER a "first-day" which was felt to be one of the slowest, activity at Castle Bromwich increased rapidly. Although the general opinion was that interest was comparable with 1952, orders generally fell some way behind inquiries. Attendance during the first day was approximately 1,000 less than that of a year ago, and most exhibitors were disappointed by the slow start. Although it is generally recognised that the first three or four days at Castle Bromwich can rarely be described as brisk, due to the tendency for overseas visitors to spend most of this time in the Olympia and Earls Court sections of the Fair, the level of attendance and number of stand visitors was the lowest for many years.

Overseas Visitors

Representation from overseas, although not so promising as might have been expected, was fairly even in those countries expected to buy in quantity. Australian, South African and American buyers were in evidence, whilst as an indication of increasing activity in the Far East, Japanese visitors excited some attention. They showed considerable interest in electrical exhibits, particularly in capital rather than consumer goods. From Europe, Sweden and Holland were well represented, whilst the Yugoslav Ambassador and his commercial counsellor were present at the opening ceremony. The presence at an official luncheon during the first week, of the Polish Ambassador, was taken to be a sign of increased interest from countries in the East European bloc.

Reasons for the relative inactivity from overseas, which was evident despite the number of official visitors, can never properly be determined, but the change in world markets from sellers to buyers has played an important part. This particular aspect was emphasised by Mr. D. D. Walker, President of the British Engineers Association, at the luncheon mentioned earlier. Some mention has also been made that British prices and delivery times were too high, but little evidence was found to support this belief, at least in the Electrical Section. Another factor which no doubt has contributed in some measure to this state of affairs is that new equipment can rarely be developed each year, consequently some repetition of exhibits occur which will obviously provide less to attract potential customers from overseas markets.

Prestige Stands

Previous comments in our issue of April 23 indicated that many of the larger companies at least, were aiming at maintaining prestige rather than attempting to display for selling. It was noticeable that "eye-catching" exhibits of this nature proved their value in provoking conversation which, in turn, led to inquiries of sufficient value to be followed up. Among particular items exciting interest, that of

Left is shown Westinghouse's attractive stand, whilst on right is the range of motors displayed by B.T.H.

The continuous supply diesel generator, with control and synchronising unit, which E.C.C. are showing

switchgear stood out, reports indicating that a predominant number of inquiries were being received in this sphere. There is little doubt that many firms regard the Fair as a valuable meeting ground for discussion or contact with potential buyers outside their obvious field, but how much business is effected is debatable.

In contrast to previous practice, the Fair was open to the public every afternoon. Whether this has had a beneficial result is open to question. Whilst some exhibitors found the added interest, even if non-technical, tended to be a stimulus, others thought it more a nuisance. Attendance figures were higher in the latter part of last week than in the previous year, but here again, it is not difficult to conclude that the public were responsible.

Individual Exhibits

Among individual exhibits which are displayed on stands in the electrical section is a model of a digital computer being shown by Ferranti, Ltd. (C615/514). This, an improved and more compact version of that in use at Manchester University, has excited considerable attention. A machine of similar type was recently supplied to the Royal Dutch/Shell Group.

Among switchgear on show is that featured by the English Electric Company on Stand C613/512. It is their class F.600 air-break switchgear, frame mounting, incorporating the company's standard OB.2 and OB.3 circuit-breakers. Three frame sizes are available for circuit breakers up to 1,600-amp capacity, whilst the usual rupturing capacity is 25 MVA.

Prominent on the Belmos Co.'s stand is their cubicle-type switchgear. Attractive in appearance, this gear uses circuit-breakers the company installs in their mining equipment, and is constructed to be easily extended.

During his tour of the Fair, H.R.H. the Duke of Edinburgh was shown the 50 kV electron-microscope which the Metropolitan-Vickers Electrical Co. are displaying on their stand. It is a four-lens instrument, employing three image-forming lenses, together with a condenser lens controlling the electron beam intensity, to obtain magnifications of up to 10,000 times. Another exhibit in the electronic field is protective equipment for oil burners. Shown by the Rheostatic Company, Ltd., on Stand C.500, the gear measures the light output of the oil flame itself, utilising the rectifying properties of a photo-electric cell.

E.C.C.'s Diesel Alternator

An unusual diesel/generator set is being shown by the Electric Construction Co., designed for supplying an uninterrupted supply on mains failure. With mains supply intact, the alternator part of the set acts as a motor, driving a flywheel. On mains failure, however, this machine reverts to its generating function, supplying power to operate a magnetic clutch. When engaged, the clutch connects the crankshaft of diesel engine to the flywheel, whose kinetic energy suffices to start the engine. This continues to drive the alternator until the mains supply is restored, when both supplies are automatically synchronised and the engine is cut out.

On the Westinghouse Brake and Signal Co.'s Stand (C508) is being demonstrated the impressed current method of cathodic protection, using, with a tank of water, a model of a ship moored at a quayside. As the level of the water changes to represent tidal variations the equipment in use varies the current to ensure that its density/unit area of quayside remains constant at almost all levels.

A variety of domestic appliances are on show, among which is found, of value for the smaller house or flat, a small refrigerator displayed prominently by Astral Equipment, Ltd. This, of 1½ cu ft capacity, was briefly described in our issue of April 23, when, in describing an illustration, it was erroneously stated to have a capacity of ½ cu ft. We should also like to point out that due to an error in the catalogue United Ebonite, Lorival, Ltd., and Permali Ltd. were given the same stand numbers. The latter's stand is quite separate.

Our readers' views ...

Wiring in Old Houses

IN response to your contributor, A. Creighton, for information regarding testing in old houses, may I recommend that he consults the most informative article by "Megohm" in your issue of November 29, 1951, page 982. Therein are clearly enumerated both electrical and visual tests to be applied.

Whilst an accurate opinion may be offered for any installation, the components of which are exposed to view, an increasingly more difficult task arises, as more and more of the installation cannot be inspected. One question I always ask myself is, "Are the cables being used as intended by the makers; and if this is not the case I would become suspicious. I know of installations which have been in use for 30 years, in identical houses with apparently identical operating conditions, and yet while some have failed and have been renewed, others are still in service, the cable insulation is still good, and I would not like to hazard a guess as to the years of life remaining.

In this subject perhaps more than in any other, experience can be the only safe yardstick, whether the experience is that of the consultant, engineer, or electrician.

Ronald W. Marsh

CHADWELL HEATH, ROMFORD

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Socket-Outlets

I HAVE read with interest an article by Megohm in the April 16 issue of your publication. This article deals with the provision of an adequate number of sockets in houses at present being built.

The policy outlined has been advocated by my company for many years, and we have always endeavoured to bring home to architects and electrical authorities the necessity for making this provision. Unfortunately, however, the first thing that seems to be cut in housing estimates is the electrical installation.

The necessity for manufacturing adaptors for use on 13-amp installations would, in my company's opinion, be unnecessary if sufficient outlets were available, but from the quantity of adaptors which we have sold in the past it must be assumed that the need for additional socket outlets is general throughout the country.

It is hoped that the points raised by Megohm in his article will be read in the quarters most responsible for the ultimate specifications on electrical installations.

D. Revington

NETTLE ACCESSORIES LTD.

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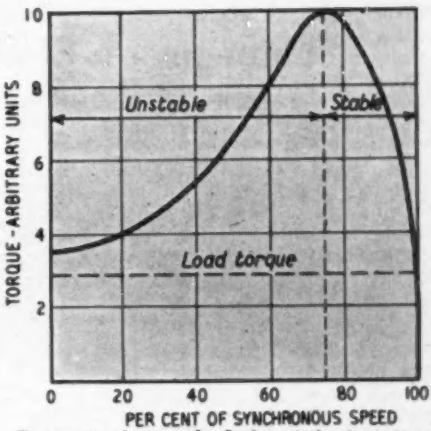
Schrage Motor Characteristics

I WOULD like to refer to a statement made by Mr. J. L. Watts, in his excellent article on the Schrage Motor, published in your issue of April 16, 1953.

Mr. Watts remarks that when operating as a normal inverted induction motor, that is, with each pair of brushes in line, the motor torque will fall as acceleration proceeds. This statement is misleading as from rest up to 70 — 80% of synchronous speed the motor torque and acceleration increase with increasing speed.



Torque-speed curves for 3-phase induction motor

Mr. Watts states correctly that the motor torque is proportional to the product of flux, secondary current, and secondary power factor. Since the ratio of secondary circuit reactance/resistance at rest is large (five might be a representative figure) the power factor is low and so consequently is the torque. Only when the speed has exceeded that corresponding to maximum torque, which occurs when the

secondary reactance becomes equal to the resistance, does the motor reach the stable portion of its characteristic.

I might also point out that below synchronous speed the rotating flux revolves in space in a direction opposite to that of the rotor, not vice versa as Mr. Watts has it.

W. K. M. Wood B.Sc.

RENTON, DUMBARTONSHIRE

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Changing Ideas on Wiring

IN his interesting article "Megohm" does not go quite far enough, as my experience has been that to a large and growing extent the practice of burying t.r.s. or plastic sheathed cables directly into concrete floors, etc., is being abandoned, mainly on the grounds that unsuspected damage to sheathing and/or insulation during the building operations has led to early breakdown, with considerable difficulty in replacement.

It is now found that the use of flexible non-metallic conduits with p.v.c. insulated cables costs little, if any, more than the use of sheathed cables, whilst the inestimable feature of drawing-in facility is retained. Although these conduits may appear somewhat more expensive on a footage basis than steel conduits, the enormous saving in labour—the really serious item in costs to-day—brings the completed installation comparable with directly-buried t.r.s. or similar sheathed cables. Technically, the direct burying of sheathed cables has nothing to recommend it, and we should not sacrifice too much in order to secure cheap installations.

T. C. Gilbert

FOLKESTONE

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Layman's Province

IS not J. R., in your issue of April 23, being rather hard on the layman? To call altering the setting of a water heater thermostat "dabbling with the electrical system" is surely going a little too far.

Would it not be true to say that a water heater that was wired up in such a way that a disarrangement of the cable brought the lead sheathing in contact with the positive terminal inside the terminal box of the heater was a badly connected water heater?

E. M. Ackery

E.D.A., LONDON, W.C.2.

Flameproof Electrical Equipment

THE growing importance of flameproof electrical equipment in the mining and chemical industries is well shown by the amount of work being carried out by the Electrical Research Association on this subject. Three reports have recently been released of which the first G/T 271 is entitled "Flameproof Electrical Apparatus : Flanged Joints One Half-inch in Radial Breadth, with Atmospheres of Normal Butyl Alcohol and Air." This deals with the third of a series of investigations to determine the effect on maximum safe gaps, experimental and statistical, of reducing the flange width from 1 in. to ½ in. The previous two reports covered pentane and heptane. The effect of the reduction is to reduce the experimental safe gap from 0.037 in. to 0.032 in. (about 15%), and the reassessed statistical maximum safe gap from 0.028 in. to 0.023 in. (about 16%). The work was carried out by Messrs. H. Robinson and H. L. Williams.

Similar work is reported in G/T274 where acetone-vapour and air was used as the explosive mixture. In this case the maximum experimental safe gap was found to be 0.034 in. and the statistical maximum safe gap 0.025 in. In both reports some comment is made on the necessity to re-determine the figures for 1 in. flanges. The same authors, with the addition of J. T. W. Roper were concerned in this work.

Third of the reports G/T278 "Ignition of Methane-Air Gas Mixtures by Capacitative Spark and Discharges," by H. G. Riddlestone, describes measurements on the minimum energy necessary for the ignition of methane-air gas mixtures in capacitative circuits.

The effects of circuit-voltage, resistance and inductance on the incendivity of the discharge were determined, and it was found that previous ideas that series resistance and inductance had no effect on the minimum ignition energy did not agree with experimental results. However, it is pointed out that the experimental information obtained so far was not sufficient to allow an explanation of the results to be given, and more information was required about the discharge itself.

The Reports are available from the E.R.A., Thorncroft Manor, Dorking Rd., Leatherhead, Surrey. G/T271—10s. 6d.: G/T274—10s. 6d. and G/T278—7s. 6d.

Rectifier Control of Synchronous Motor Excitation

Part 2. Development of a New System using Mercury Arc Rectifiers to give Automatic Control

By R. WELLS, A.M.I.E.E.

TESTS were continued on the salient pole type synchronous motor described in Part 1 of this article to determine the effect of a suddenly applied overload.

The test synchronous motor was first set up with normal value constant excitation and an oscillogram of line current recorded at the time of sudden application of a load in excess of the pull-out value. The result is shown as Fig. 11. It will be noted that the machine remained stable for about 30 cycles (with the current increasing some 150%) before it finally dropped out of synchronism. The test was then repeated, making no alteration except to change over from constant excitation to rectifier controlled excitation. The result is shown as Fig. 12. As will be seen, the current increase is now only some 30% (due to power factor improvement) and there is absolutely no disturbance or sign of instability. This test shows that good results can be expected of rectifier controlled excitation when a motor is called upon to deal with suddenly applied overloads, and the reasons for this are not difficult to find. In the first place, the inherent speed with which correction is first applied is very fast, as the rectifier can change its output at the commencement of the next anode conducting period after the need is felt; i.e., in something under one-third of a cycle for a three-phase rectifier. It is also thought, but this has to be confirmed by further investigation, that some benefit derives from the fact that during the period of angular acceleration or de-celeration of the rotor, which results from a change of load, the changing load angle causes the grid-controlled rectifier to be instrumental in correcting the excitation every 120 electrical degrees—the same phase-spacing as the stator winding—so that the transient corrections always take place at equally spaced rotor positions. (Every one-third revolution for a two-pole machine, every one-sixth

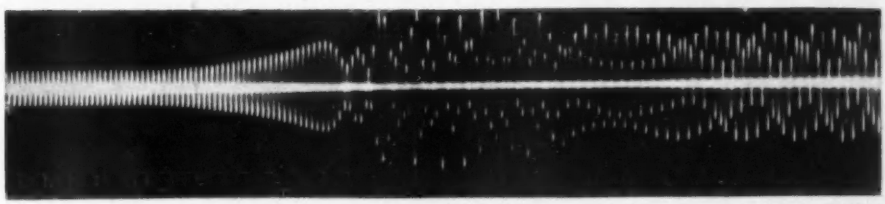
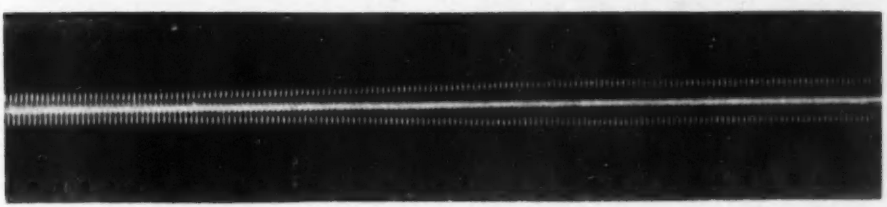


Fig. 11 (above). Oscillogram of line current when a load exceeding the pull-out value is suddenly applied to a salient pole synchronous motor having constant excitation

Fig. 12 (below) shows an oscillogram of line current for the same conditions as in Fig. 11, but using the rectifier-controlled excitation described in this article



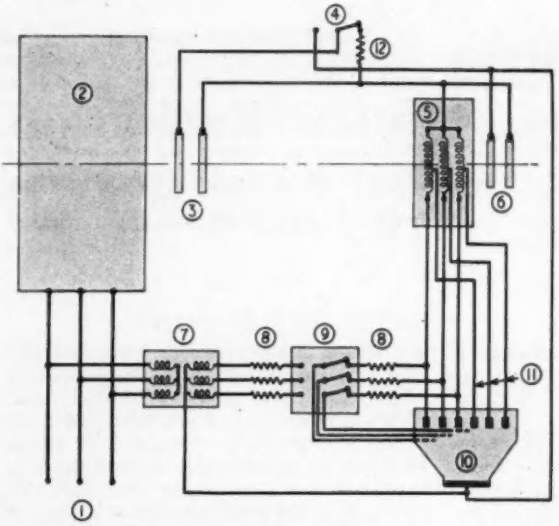


Fig. 13. Diagram of connections for salient pole type synchronous motor with excitation controlled by dual-phase rectifier, showing rotor circuit changeover switch for starting-synchronising, grid circuit changeover switch for fixed-controlled excitation, and self-excited exciter alternator

1. *Three-phase supply to motor.* 2. *Salient pole type synchronous motor.* 3. *Motor slip rings.* 4. *Rotor circuit changeover switch.* 5. *Exciter alternator.* 6. *Exciter alternator slip rings.* 7. *Grid circuit phase shifter.* 8. *Grid current limiting resistors.* 9. *Grid circuit changeover switch.* 10. *Dual-phase rectifier.* 11. *Free-firing basic excitation anodes.* 12. *Motor rotor discharge resistor*

revolution for a four-pole machine, etc.)

Rectifier controlled excitation also contains its own inherent field-forcing quality and, moreover, it is of such a nature that it is not brought into play unless required and it acts for both field strengthening and field weakening. For example, suppose that under transient conditions and owing to self-inductance, the change of excitation current was not sufficiently rapid to prevent the load angle changing by more than the proper controlled amount, then the excessive change of load angle would itself produce temporary over- or under-correction as the case may be. It is possible that with such a good performance under transient load conditions, machines and loads of low inertia will be kept in stable synchronous running during short peak overloads just as well as high inertia machines and loads. This will help resolve the dilemma of a low inertia being best for easy synchronising and a high inertia being best for stable operation once synchronous running has been effected.

A further advantage with rectifier controlled excitation is, of course, the fact that in any case only one field has to be changed (the main field) and this, in itself, improves response times.

Starting and Synchronising

The usual methods of starting synchronous motors may still be used when rectifier controlled excitation is to be used. In the case of the salient pole-type motor which starts up as a squirrel-cage induction motor with the rotor

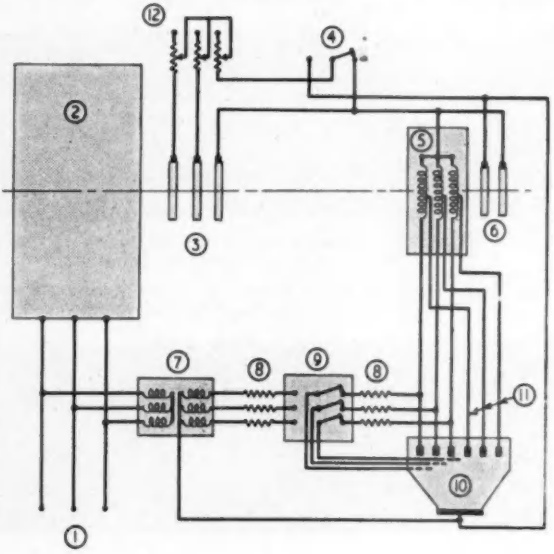


Fig. 14. Diagram of connections for induction type synchronous motor with excitation controlled by dual-phase rectifier, showing three-phase starting rheostat, rotor circuit changeover switch for starting-synchronising, grid circuit changeover switch for fixed-controlled excitation, and self-excited exciter alternator

1. *Three-phase supply to motor.* 2. *Induction type synchronous motor.* 3. *Motor slip rings.* 4. *Rotor circuit changeover switch.* 5. *Exciter alternator.* 6. *Exciter alternator slip rings.* 7. *Grid circuit phase shifter.* 8. *Grid current limiting resistors.* 9. *Grid circuit changeover switch.* 10. *Dual-phase rectifier.* 11. *Free-firing basic excitation anodes.* 12. *Starting rheostat*

connected to a discharge resistor, the synchronising arrangement would be as shown in Fig. 13. Figs. 13 and 14 also show the dual-phase rectifier connection which was mentioned earlier in the article. As will be seen, the supply to the rectifier grids is controlled by a triple-pole make-before-break changeover switch with two sets of grid current limiting resistors. During the starting period, each grid is connected to its associated anode (via a resistor) so that from zero speed up to normal synchronous speed the rectifier is free-firing. The exciter changeover switch is now operated and the motor pulls into synchronism with the rectifier still free-firing. The grid changeover switch is now operated and this brings into being the automatic excitation control feature.

Precautions taken in Excitation Supply

It should be noted that the use of a make-before-break changeover switch ensures that the grids are at no time de-energised, and also that the use of two sets of grid resistors prevents direct connection between the two sources of grid supply during operation of the grid changeover switch. Fig. 13 shows also an arrangement whereby the field of the exciter alternator is supplied by its own main windings (via the rectifier). This is done for two reasons, firstly, so as to avoid the use of a separate supply or another exciter, and secondly, so that the exciter alternator itself derives benefit from an excitation which increases with load on the motor. By this means the inherent voltage regulation of the exciter alternator can be reduced and it even becomes possible to impart an over-compounded characteristic, so that the increase of main motor excitation is brought about not only by a reduction of rectifier anode firing delay but also by an increase of anode volts. It will be appreciated, then, that the results shown in Figs. 9 and 10 (in Part 1), where a constant exciter alternator voltage was used, are not necessarily optimistic.

In Fig. 13 the main motor field and the exciter alternator field have been shown connected directly in parallel as would be the case if both fields were designed for the same voltage. In practice a greater flexibility could be provided by arranging for the normal voltage required at the main slip-rings to be greater than that required at the exciter alternator slip-rings and for a variable resistor to be connected in series with the latter. Again, it would be possible to connect the fields in series and arrange a diverter across the lower current one—normally the exciter alternator field.

In the case of the induction type motor the arrangement would be similar—see Fig. 14—with provision for the usual starting rheostat to be used.

General Advantages

By using an exciter alternator instead of a d.c. exciter, the whole installation is made commutator-less. The whole of the control gear is static, simple, and therefore reliable and it should prove cheaper than any other system giving the same results. Owing to the self-inductance of the machine field, it is not necessary—in spite of anode firing delay—to provide any smoothing of the rectified current. It is possible to modify the inherent performance curve of a synchronous motor to almost any desired shape. It is also possible—by providing a phase-shifter in the grid circuit (to control the fixed relationship between motor load angle and rectifier anode firing delay), and tappings of various voltages for the free-firing anodes (to control the no-load excitation and, therefore, power factor), also a series resistor in the exciter alternator field (to control the ultimate degree of motor excitation)—to provide a *range* of modified performance curves to suit a variety of needs.

A further advantage is that the scheme does not require any current or potential transformers, neither does it rely on any external reference source. This has of course considerable financial and technical assets.

Since, also, the excitation control is dependent upon the fundamental quantity of motor load angle it does not matter whether the motor is in danger of falling out of synchronism due to a heavy load, or due to a reduction in supply volts, or due to both factors, the excitation will still be automatically increased by the same amount for a given change of load angle.

The system of automatically controlled excitation described in this article is of the author's invention and is the subject of patent application.

The author's thanks are due to Hackbridge and Hewittic Electric Co., Ltd., for permission to publish the information contained herein, and to Mr. H. N. Ashley and the test-room staff of Messrs. Mather and Platt, Ltd., for carrying out many of the experimental tests.

Appendix Note

The power factor load curves shown as Figs. 6, 7, 8, 9 and 10 in Part 1 are based on practical test results, and therefore, owing to the no-load losses of the machine, the curves do not start from zero a.c. watts. Apart from Fig. 6 then, where hunting prevented it, the curves start from the zero mechanical load condition.

ELECTRICAL HUSBANDRY

Benefits of soil warming and artificial illumination investigated by E.R.A. at Shinfield

UTILISATION of electric power in agriculture and horticulture requires not only suitable electrical equipment but its full and proper adoption. For it is only by the favourable load characteristics of a large energy consumption at a small power demand that any attempt at satisfactory rural electrification can be economically worth while. To this end research at the E.R.A. field station at Shinfield has been devoted since its opening in 1945. This week the station is holding an open week for visitors representing both agricultural and electricity supply interests to view present activities.

A major part of land at the site is being used to determine the possibilities and best use of electrical soil warming. The area devoted to this purpose is part set out in frames and part open, to investigate soil warming for propagation of plants and for their maturing.

Suitable for purely propagation purposes is a single frame in which two soil warming systems have been installed. One is of the low voltage type, run in the soil and used for soil warming, whilst the other is a mains voltage system mounted above the earth, round the inside walls. Thermostatically controlled, this system warms the air to counteract frost.

A much larger installation, consisting of 45 single span frames, each taking two Dutch lights, is fitted with bare, galvanised steel, low-voltage warming wires. Here the technique has been to restrict the daily supply of energy to an economic amount rather than control the earth temperature. Some indication of the effects of such warming is given by figures which show that at a daily supply of 75 Wh—at approximately 45 Wh/sq ft of earth surface—the accumulated total of lettuces picked from the frames is nearly six more than those growing in areas supplied with 38 Wh/day. The length of time on which these figures are based extends for three weeks in March.

Below is shown the cable tower for supplying the electrically powered tractor, illustrated on right

To investigate effects of soil warming in open ground some 18 plots are used, each giving six replications of three different treatments. Two degrees of soil warming are used, one at 90 Wh/sq ft/day, the other at 60 Wh/sq ft/day. The experiments are being conducted with varieties of daffodils, and the results so far obtained show, in the worst case, plants in soil-warmed ground are 10 days ahead of those in

untreated ground. In the best case, plants are as much as 20 days ahead.

A considerable proportion of the work at Shinfield is devoted to determining the value of artificial illumination in propagating plant growth. Two compartments in one of their larger greenhouses are set aside for this purpose, each being heated with low-voltage conduit installations. A variety of light sources is used, including neon, high pressure and fluorescent mercury discharge lamps, sodium and tungsten filament lamps.

Although little difference between the effect of each source on propagation is apparent, the use of lighting is itself a paying proposition for short-term use. Results have indicated that, for tomatoes, an extra half pound of fruit may be obtained from each plant. For large quantities, this is equivalent to 500 lb/acre, from which the revenue, it is estimated, will pay off capital expenditure on electrical equipment in one year.

Above is illustrated an example of soil warming in open ground under cloches using a low voltage system

Left can be seen tungsten lamp and blended light sources used for propagation of plant life by artificial illumination

A prominent feature of the site is a large tower upon which cable is hung to supply an electrically powered tractor. Here the emphasis has been on supplying the tractor, the method at present evolved being to suspend loops of a special 4-core cable from the cross arm at the top of the 35-ft tall tower. Each loop is tensioned by weights attached to pulleys riding on the cables to ensure that nowhere between tower and tractor is the cable less than 3 ft from the ground. Powered by a 3-phase 6-h.p. motor, the tractor is a standard type converted to electrical power drive. The drive itself is effected by infinitely variable hydraulic gearing which also serves as a clutch. Slip-rings on the cable entry to the tractor prevent twisting of the cable as the tractor turns.

Laboratory work at the site is devoted to a considerable number of problems, among which is that of pest control in grain and seed. At present, attention is concentrated on the use of high-frequency electric fields, and a small plant operating at 14.5 mc/s is being used. Infected seed is subjected to the field which kills the insect without damaging the host material. For cleanliness and reliability this method has distinct advantages over others involving gas poisoning. No equipment for use on a large scale at present exists, and although its capital cost would be undoubtedly high, running costs would, it is estimated, be of the same order as those for other equipment in use today.

Another feature of the site is a heat pump installation. The pump, designed and installed by the E.R.A., not only provides space heating for one of the laboratory buildings, but affords opportunities to record its operation. Driven by a 7.5 kW motor, the pump can make available, in heat, as much as 28 kW, a performance energy ratio of 3·8. The heated water is stored at a temperature of 120-125° F in an insulated tank.

PROBLEMS AND PRACTICE in Engineering

Slip-ring and Brushgear Troubles

UNDUE wearing of slip-rings and excessive sparking are sometimes experienced on almost all sizes of turbo-generators. These troubles can generally be found to arise from one or more of the following: (1) incorrect brush pressure; (2) incorrect grade of brush; (3) brushes fast (too tight) in holders; (4) brushes left in contact with slip-rings when shut down; (5) rotor out of balance; (6) current density of brushes excessive; (7) wear due to current flow (depending upon direction of flow).

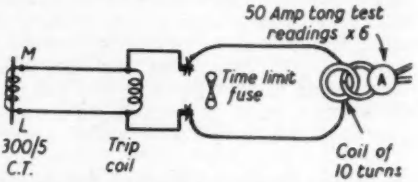
The last-mentioned item usually accounts for considerable wear of the negative ring, this being due to the action which takes place between the brush and the slip-ring being dependent upon the direction of current flow. The current flow, being from ring to brush, causes particles of metal to be transferred, as it were, from the ring to the brush contact surface. These particles tend to produce an abrasive action between ring and brush, with the result that considerable wear of the negative brush takes place.

This effect can be somewhat neutralised by periodically changing over the polarity of the exciter or simply interchanging the slip-ring brush leads. The period over which this changeover is advisable depends very largely on the general operating conditions and electrical loading of the machines.—*C.B.Y.*

C.B. Loading Test

THE power distribution from the factory substation consisted of a bank of 300 amp. 440 V o.c.b.s which were fitted with 300/5 c.t.s in each phase for over-current protection through trip coils in parallel with time-limit fuses. Originally each c.b. was fitted with a 300/5 ammeter in one phase but these were removed later and replaced with 5A single-phase kW h meters for internal accountancy purposes. With the growth of load in the various departments served through the c.b.s, the periodic check of the loading by ammeter became necessary, but the insertion of a meter or even tong-test ammeter was no easy matter as the outgoing cables were 3-core p.i.l.c., and the small wiring from the c.t.s to the kWh meter or time-limit fuse was inaccessible, making a troublesome job with even the opening of supply to obtain the necessary ammeter connection.

An easy method of obtaining the required information was adopted by the use of a 50 ampere tong-test ammeter used in conjunction



Connections of tong-test ammeter to measure c.b. loading

with a coil of 10 turns through which the ammeter was clipped. The coil has tails of about 18 ins. fitted with crocodile clips which are attached to each side of the time-limit fuse clips and the fuse then withdrawn. A check with a 300 amp. tong-test ammeter in the main circuit showed the method to be sufficiently close for practical purposes at all loads. Using a testing set ammeter on a 12 amp. range, the method gave a reading about 8% low due to the shunt effect of the trip coil.—*T. H. Snelson.*

The Elusive Earth

THE trouble experienced by your contributor "J.R." and the risks to which the consumer was subjected (issue dated April 23, 1953) would have been avoided, I suggest, if the immersion heater wiring, when first installed, had complied with the I.E.E. "Regulations." Paragraph 1309 states that immersion heaters should be connected by means of asbestos-roved flexible cords or rubber insulated cords, the conditions deciding which of the two types to be used being described in the regulation. The use of lead-covered wire, as described by your contributor, is clearly a contravention of rule 1309 besides being an obviously dangerous use of this type of cable. It is to be hoped that the cable was replaced when the fault was located.—*R.A.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

BOILER AVAILABILITY

Further Researches into Deposit Troubles

FOUR new publications have recently been issued by the Boiler Availability Committee. Of these, two are reports and two deal with past papers. The Reports are entitled "Second Interim Report on External Deposits and Corrosion in Boiler Plant" and the "Burton Investigation Group Report on the Relationship between the Chlorine Content of the Coal Burned and the Availability of a Stoker Fired Boiler."

External Deposits

The report on external deposits and corrosion covers the work done on this important subject over the period 1946-1951, and follows on from Bulletin No. MC/153. In that earlier report, the deposits had been classified as high temperature types, which included alkali matrix, phosphatic and fusion or slag, and low temperature types which were referred to their locations as economiser or air heater deposits.

The question of the mechanism sulphur influence has been explained by several theories, one of which is that since combustion in modern boilers can reach temperatures of the order of 2,500° F, and sulphur trioxide is unstable at such temperatures, the production of this compound must occur after combustion has taken place, and that the subsequent catalytic oxidation of sulphur dioxide on the heating surfaces, where these are at a sufficiently high temperature, is responsible.

This theory, together with conclusions drawn from laboratory work, was applied at Ribble Power Station where high sulphur content coals were being burned and where superheater blockage and air heater corrosion were particularly troublesome. It was thought that sulphur trioxide was being formed on the superheater tubes, and action was taken to reduce this temperature from 1,100° F to about 900° F. Despite this reduction the outlet steam temperature of 850° F was maintained, and as a result of the lower temperature the air heater blockage and corrosion and superheater blockage were so reduced that the boilers can be operated from one annual inspection to another instead of over a period of only two to four weeks as before.

At Burton-on-Trent, work has been done to attempt to derive a relationship between chlorine content and fouling (this is the subject of the second report) and it is commented that although the high chlorine content coal caused difficulty at Burton, the same coal was being successfully fired at Acton Lane. The reason for this difference was still being sought.

The report also considers the effect of the method of burning the coal on the fuel bed and on deposits and corrosion, and gives some details of the methods and techniques evolved for measuring the important factors within boilers. It concluded with a description of the laboratory equipment installed at the Fuel Research Station.

The Burton Trials

The second report gives details of work carried out at Burton to determine the effect of chlorine on deposits, and arrangements were made to carry out tests on coals of very high, high and low chlorine contents.

Before the tests began, the rapid formation of bonded deposits had made it impracticable to operate the boilers at m.c.r., and on two-shift operation, at approximately normal economic rating, the formation of bonded deposits limited the length of boiler runs to some 1,200 hours. Preliminary samples of deposits from the boilers showed that the main cause of build-up of bonded deposits, particularly in the superheater zone, was the high content of volatile alkali compounds in the fuel.

The three selected coals were Thoresby (Top Hard) 1-in. dry slack (0·95% Cl), Rawdon Moira 1-in. dry slack (0·46 Cl) and Whitwick (Forest) ¾-in. smalls (0·03 Cl).

The main results from these trials are given below in tabular form :

TABLE 1. TEST RESULTS USING DIFFERENT COALS

Coal	Loading	Length of run* (hours)	Coal burned (tons)	% Chlorine in coal
Thoresby	m.c.r.	532	2,721	0·95
Thoresby	n.e.r.	780	3,192	
Rawdon	m.c.r.	1,200	5,700	0·46
Rawdon	n.e.r.	4,100	12,630	
Whitwick	m.c.r.	*8,240	38,000	0·03

* The run with Whitwick could have been continued for a longer period, but as the boiler was due for annual survey, the information obtained was considered conclusive and the run terminated.

Prior to each trial, the boiler-heating surfaces were carefully cleaned down to the bare metal using steam soaking and water washing, so that the starting points of the various trials

should be strictly comparable and any error due to mixing of deposits formed in successive trials eliminated. Throughout the trials, careful attention was given to maintaining optimum combustion conditions, and the coal was conditioned by adding water by sprays fitted to the heads of the traversing chutes and steam was injected halfway down the chute.

The end of a run was taken to be when the draught loss across the boiler rose to twice the value existing at the beginning.

The results demonstrated in a striking manner the connection between boiler availability as determined by the external fouling of the superheater, and it was also noted that the continuous supply of uniform quality of coal made it possible to obtain an optimum combination of fire thickness, grate speed, air distribution, etc., which resulted in a reduction in the heat rate (B.Th.U./kWh S.O.) achieved in the trial years 1946-49 as compared with 1945 of 8·5%.

The other two publications consist of a bibliography of papers relating to external fouling and corrosion, and summaries of published papers. The address of the Boiler Availability Committee is 8 Waterloo Place, Pall Mall. London, S.W.1.

132 kV Submarine Cable

Impregnated Pressure Type for Australian Project

TEN miles of cable in two five-mile circuits are being laid by the Electricity Commission between two substations on the outskirts of Sydney. A crossing of a tidal arm of the Parramatta River is, however, involved, and B.I.C.C., who gained the contract for the supply of the cable, have specially constructed two 404 yd lengths for underwater use.

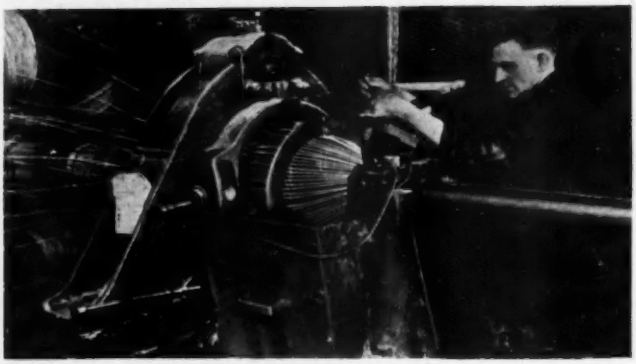
The underwater cable does not differ radically from its land counterpart for 132 kV; in fact, the 0·3 sq in. screened circular copper conductors and the insulation and screening of the three cores are identical with land cables. The main differences lie in the sheath (0·145 in. min. compared with 0·125 in.), which is reinforced with tin-bronze strips and tapes instead of steel and is also armoured. This is to act as an anti-corrosion preventative in the event of damage to the outer protective covering.

Over the reinforcement are one cotton tape, two self-sealing rubber tapes, a further cotton tape and three hessian tapes. Armouring is by a single layer of 0·16 in. dia. galvanised steel wires over the main anti-corrosive protection, and a final serving is applied of two layers of bitumen-impregnated hessian tape.

The change in external dimensions is that the overall diameter is 5·29 in. compared with 4·59 in. for armoured land cable, and the weight increases from 62 lb/yd to 90 lb/yd.

Pressurising is carried out at 200 lb/sq in. N_2, and the two circuits are each capable of carrying a continuous load of 85 MVA. Under simultaneous loading they can carry 77·5 MVA each to give a total of 155 MVA. The loading is dictated by the safe limits of the shore cables.

The two lengths of underwater cable were supplied on two drums, each 12 ft in dia. and 9 ft 4 in. wide, with a gross weight of 19 tons.



This photograph shows the armour being applied to the 132 kV impregnated pressure cable being supplied to Australia by British Insulated Callender's Cables Ltd. for use under tidal water

Experience with Pressure Cables

Pneumatic system troublesome in successful design

IN 1940, two short runs of B.I.C.C. impregnated pressure cable were installed as 66 kV busbar interconnectors at Battersea power station: by November last year some 150 miles of this design of cable were in operation in this country at voltages from 33 to 132 kV. The operational experience acquired in this period is recorded in a paper by Messrs. L. G. BRAZIER, PH.D., B.SC., M.I.E.E., D. T. HOLLINGSWORTH, M.I.E.E., and A. L. WILLIAMS, PH.D., M.SC., A.M.I.E.E., which was read before the I.E.E. Supply Section on Wednesday last.

The impregnated pressure cable has a mass impregnated dielectric which is maintained under a pressure of 200 lb/sq in. by nitrogen acting directly on the dielectric. In single core cables gas flows longitudinally through the core/sheath clearance spaces, while with three-core designs a gas transfer pipe is provided in one of the filler spaces to assist charging and subsequent pressure equalisation. Two reinforcement tapes are provided, one short-lay to give circumferential strength, and the other with a long-lay to resist longitudinal forces.

Design Considerations

Certain changes have been made in design since the cables first appeared. One of these is the abandonment of tinning for individual wires in the conductor. The risk of forming copper "soaps" and so contaminating the dielectric, and the desire to facilitate jointing were the reasons for this former practice, but price considerations have now prevailed. To reduce electric stress the conductors have been closely covered with metallised tapes in one recent design, and a 10% increase in both impulse and a.c. strength has been achieved.

Protection for the cable sheath and its reinforcement is still a form of rubber bitumen sandwich now consisting of a bitumen impregnated cotton tape, rubber tapes up to the desired thickness, and then another cotton tape. The latest development is to replace the cotton tape by p.v.c.

Electrical Design

33 kV is the lowest voltage at which the impregnated pressure cable can be justified economically. The dielectric design is based on a maximum conductor stress of 85 kV/cm, and this results in a wall thickness of 0·1 in. for most conductor sizes at 66 kV, the design stress is raised to 93·5 kV/cm, giving a wall thickness from 0·24 in. (smallest conductor size) to 0·18 in. 132 kV cables now seem likely to operate at 100 kV/cm, the dielectric thickness ranging from 0·5 to 0·4 in. At 275 kV, 110 kV/cm is the present limit, the a.c. voltage conditions (rather than the impulse test) being the determining factor. The dielectric for the most economical conductor size is likely to be 1 in. If the required current-carrying capacity does not justify a copper conductor of this size, the use of aluminium becomes attractive.

Gas feed points are provided at four-mile intervals on a three-core cable run, with gas sectionalising boxes a mile apart to facilitate fault-finding.

Operational Experience

Joint failures occurred in one early installation where pre-shaped factory-made paper-roll stress cores were used in straight-through joints, but no trouble has been experienced since the practice of hand-applying pre-impregnated paper tapes was adopted. Only one cable failure has occurred, and this was on a three-core 33 kV 0·4 sq in. cable which was distorted by ground subsidence while it was out of commission. There has also been one sealing-end flash-over, but otherwise the electrical performance of the cable is characterised as "completely satisfactory."

A number of cases of gas leakage have been reported, a high proportion in the gas-feeding equipment. There have been 10 cases of leakage through the cable sheath. One has occurred with an aluminium sheath, and has been traced to a minute ferrous inclusion in the aluminium. This leak was found during the installation of the cable. In the case of the lead sheaths, there have been three main types of leak: that caused by disturbance of the longitudinal reinforcing tapes, with subsequent penetration of the sheath; that caused by an early weakness in the design of cast plumb at the end of the joint; and that caused by extrusion defects—all but one of this type of last defect being found in very early cables.

Some trouble has been caused by movement

of the cable impregnating compound into positions where it restricts gas flow. Movement caused by gravity has caused a certain amount of difficulty in a very few cases. A more frequent problem has been movement caused by frothing. Nitrogen is soluble in cable impregnating compound, one volume of compound absorbing one-tenth volume of gas.

Frothing occurs when the cable pressure is released, and it is carried in general into the joint sleeves, whence it may move into the gas channel pipes, which may thus become filled with compound. In consequence, the rate of recharging with gas is slowed. To reduce frothing, release of gas pressure must be carried out relatively slowly.

Future Developments

Simplification of joint design may be desirable, since a 33 kV straight joint takes 50 hours to complete. However, since the joint has proved highly successful electrically, modifications must be made with caution. One desirable improvement is the avoidance of the double sleeve now standard, as the plumb to this has been the cause of some leaks.

It is considered that in regard to the cable itself, it is only in the pneumatic features that improvements are justified—apart, that is, from the general modifications discussed earlier. Compound movement will not affect stability, impulse performance, or performance under normal a.c. conditions. It may affect performance at exaggerated a.c. voltages, but such tests are not fully necessary.

DISCUSSION

MR. D. B. IRVING (L.E.B.) said that the development of this cable system was at the stage where the user could have complete assurance of its reliability. There was, however, room for improvement in the pneumatic performance. Whilst he was in agreement on the use of aluminium as a sheathing material it was essential to have really adequate anti-corrosion protection on this type of cable.

MR. S. E. GOODALL (W. T. Henley's) thought that although the so-called mechanical joint had certain obvious merits in the design, a good deal of precise work was needed before the joint was assembled.

MR. C. H. JOLIN (Merz and McLellan) asked for assurance that no distortion of the joints would occur in the event of uncontrolled release of the gas, and also that blockage of the gas channels did not in fact occur. One feature which should be pursued energetically was the provision of better waterproof coverings which did not change so much with age.

MR. D. P. SAYERS (B.E.A.) suggested that the paper would have been of greater value if there had been some criticial comparison of the cost of this and other types of cable available for similar service.

PROF. M. G. SAY (Heriot-Watt College) raised the question of the graded paper dielectrics. He looked forward to the time when there would be improved stress control, forced cooling, and possibly an entirely revolutionary class of dielectric.

MR. G. F. PEIRSON (M.E.B.) expressed the opinion that rucking of the longitudinal reinforcing tapes must have occurred during manufacture and not during the installation of the cable. A desirable development which would help to reduce the cost would be the obtaining of longer tube lengths in aluminium, which would reduce the number of joints required.

DR. A. N. ARMAN (Pirelli-General) assured the previous speaker that the rucking of the longitudinal tapes could, and did, occur after manufacture. Had the authors any definite test information to show that if they applied longitudinal stresses of the order of 1·5 kV/cm or 2 kV/cm they were actually in danger? His own view was that radial stresses were always the determining factor.

MR. C. C. BARNES (B.E.A.) said his Authority had experienced trouble in service with poorly-applied metallised paper conductor screening. It would be of interest to know how the fatigue resistance and extensibility characteristics of the lead alloy suggested by the authors compared with that normally offered by cable makers for conditions where severe vibration existed.

MR. E. L. DAVEY (W. T. Glover and Co., Ltd.) said that in 17 years' experience he had never met any trouble associated with metallised screening tapes.

MR. G. S. BUCKINGHAM (M.E.B.) suggested that rubber was not the best material to use for the protective serving of the reinforcement tapes, bearing in mind the possible life of the cable in the ground.

MR. C. T. W. SUTTON (Enfield Cables) suggested the use of carbon paper screening.

MR. J. V. W. RICHARDS (Johnson and Phillips Ltd.) outlined a method of increasing the interval between barrier positions without sacrificing pneumatic efficiency, by reducing the pneumatic resistance with the use of three pipes.

MR. A. M. MORGAN (Enfield Cables) said that the specification of the size of leaks in terms of the volume of gas lost in unit time was insufficient in most cases. With regard to radio-active isotopes, for leak testing, his firm had found methyl bromide the most successful, having a much greater gamma ray radiation and a shorter half-life.

MR. C. H. GOSLING emphasised the need for dielectric resistance tests after installation, in order that any damage to the anti-corrosion protection could be carried out immediately.

DR. A. L. WILLIAMS replied briefly.

The Wide-Strip Mill in Europe

POTENTIAL MARKETS FOR FLAT STEEL PRODUCTS

THE development of the demand for flat steel products in the past thirty years led to the introduction of the continuous wide-strip mill. This type of mill, due to its enormous handling capacity and output, completely transformed the balance of the industry, and this process is still going on. At the same time the demand for sheet steel shows small prospect of diminishing. It is, however, advisable to consider the relationship between demand and capacity, as one of the essentials with the continuous mill is to keep its utilisation factor at a maximum, so that the high capital charges can be paid off.

Such a survey has recently been published by the Industry Division of the Economic Commission for Europe under the aegis of the United Nations Department of Economic Affairs.

The Electrical Industry

Most of the Report is, of course, of importance to the steel manufacturer and user, but a certain amount touches more closely on the electrical industry in general. One of the main requirements from the mills is for flat tinned steel for manufacture of containers, particularly for food. In the United Kingdom the demand for canned food per head is faster than the increase in real income, and the general trend is exemplified in the U.S. where beer and milk are rapidly becoming predominantly canned. Canned foods, however, compete with fresh and frozen foods, and the advantage of all-the-year-round availability with canned foods is nullified in the case of the latter. The "deep-freeze" is most significant, and its effect may be of importance. In Denmark, for example, a survey of rural communities showed that 61% of families used communal "deep-freezers."

In general engineering, the use of steel wagons and hoppers in place of existing wooden trucks is expected to give an available market for steel plate in the U.K., and the continuous and steady expansion of the electrical industry should provide a market both for mild steel and electric steels for many years to come. In addition, the trend towards welded fabricated structures in preference to castings, which has been in evidence for many years, shows little signs of abating, and this also should provide an outlet for mill capacity.

Consumer Goods

In the consumer goods field, the main outlet for sheet steel lies in kitchen appliances, and the demand for these increases with the decreasing availability of domestic labour. As the demand increases, mass production methods can be introduced and the price of the articles has a tendency to fall. In America, nearly all kitchens have a gas or electric range, 86% have refrigerators and 72% washing machines. In Sweden and in the U.K. the figures, while not so high, have a pronounced upward trend. It is, however, thought that little had been done on the European continent generally to encourage scientific and rational planning of the kitchen. In this connection the report remarks that "Food is still frequently cooked on inconvenient cast-iron stoves or coal ranges. A refrigerator is looked on as a luxury, a washing machine as something of a curiosity and an automatic dish washer with suspicion."

Utilisation of Strip Mills

The section dealing with the utilisation of the strip mills provides some interesting data. By 1956 there will be eleven continuous wide-strip mills and four Steckel mills in operation in Western Europe and three or more in the U.S.S.R. In Britain the principal plants are at Margam, Ebbw Vale and Shotton. These have for some time been working below full capacity due to steel shortage, but the installation of eight new 150-ton open-hearth furnaces at Shotton and the expansion of steel capacity at Ebbw Vale are clearing the insufficiency. The Report states that only in the U.K. is an attempt being made to operate the continuous strip mills at their theoretical "European" capacity. In all other cases there is likely to be a serious shortage of steel for the mills even in 1956, and if this is overcome, there would still be a shortage of finishing capacity. It is thought that in 1956 the mills will only be operating at 56% capacity compared with American practice and use, and as a result the heavy capital amortisation will have to be carried on a small tonnage with correspondingly high costs of production, which must be paid by the consumer.

Consumers' Load and Meter Ratings

Survey Suggests Economical Relationship

IN Great Britain some 16 million house service meters are installed, measuring energy for which about £100 m is paid. These figures show clearly how important is the engineering problem of arranging metering so that loss of revenue arising from loss of meter accuracy is in proper economic balance with the costs of maintaining that accuracy. This subject is treated in considerable detail in a paper "Meter Problems and Consumers' Load Characteristics," which Messrs. L. B. S. Golds, M.I.E.E. (Eastern E.B.) and P. Schiller, Dipl.Ing., M.I.E.E. (B.E.A.) read last week before a joint meeting of the I.E.E. Supply and Measurement sections.

The economic (as distinct from legal) requirement for determining the period between checks on a meter's accuracy is at first sight simple: the losses of revenue due to minus errors that increase with age should, when taken with the cost of servicing, be kept to a minimum. The difficulty lies in the fact that the value of net losses can be judged only if the individual consumers' load characteristics are known. Moreover, as Mr. Golds points out in Part I of the paper, this consideration introduces further complications about meter size. If a meter with too high a rating is installed it will reach the point at which it no longer meters the current economically (due to minus errors at low load) in a shorter period than a correctly rated meter. This demonstrates the fallacy of a commonly accepted view that it pays to standardise on a meter with a certain current rating. In general, it is better to instal a meter of the lowest appropriate rating, but to allow a margin for additional load when the existing connected load is low.

Service Life

Tests results are reproduced in the paper to show the effect of service life on meter accuracy at 5% and 100% loads, but it is emphasised that the effect of life on the actual registration of various makes and groups of meters over considerable periods has not been thoroughly investigated.

The other difficulty is that already mentioned of the individual consumers' load characteristics. There is at present very little detailed knowledge in regard to these. Because of the effects of diversity, recordings of group loads are of no value and measurements on individual installations are necessary. For this purpose, a load analysing meter was designed which would give a reading of energy consumption within any selected sub-range automatically, and yet would be reasonably priced in order to allow a sufficiently large sample of installations to be tested at the same time. The sub-ranges selected were 0-10%, 10-25%, 25-100%, and above 100% of the consumer's meter's rating.

Results of a survey made with the aid of such meters are described by Mr. Schiller in Part II of the paper. A sample of 100 consumers in the Northmet sub-area of the Eastern E.B. was selected by random sampling methods, and load analysing meters were installed on their premises together with thermal m.d. recorders. Characteristics of the consumers is shown in Table I. For various reasons the selected sample had a consumption 30% higher than that for all domestic consumers in the area, and 70% higher than the national average for the period of the test.

Maximum demand measurements showed that for nearly one-third of the consumers the annual m.d. did not exceed 5 amp, about one-half had less than 10 amp, and none over

Table I
CHARACTERISTICS OF THE SAMPLE

Consumers		
Average floor area	1 100 ft.²	
Average number of rooms*	5·3	
Saturation factors:		
Cooking	22%	
Water-heating	11%	
Space-heating	81%	
Average installed load	5·6 kW	
Of which space-heating	2·3 kW	
Average annual consumption	2 250 kWh	
House-Service Meters		
Average age	14 years	
Average period since last calibration	10·5 years	
	amp	%
Size distribution	5	33
	10	22
	20	33
	25	9
	40	1
	50	2

* Living rooms and bedrooms; kitchens only if separate scullery provided.

40 amp. Yet the installed load went as high as 70 amp. Demand factors showed a wide spread, but the results may be generalised as extending up to unity for installed loads of 40 amp and below, but dropping to 0·5 for 80 amp installed load. Summarised, the results of this part of the investigation suggest that for installed loads up to 40 amp a meter of the nearest (but not lower) maximum continuous rating should be selected, while for loads between 40 and 80 amp a 40 amp meter should be used.

Analysis of the load distribution results on a basis of the existing meter installation practice showed that for 5 amp meters particularly high accuracy was desirable between 10 and 25%; for 10 amp meters at below 10% and around 50% (there is a peak attributable to the use of cookers) and for 20 and 25 amp meters, over the whole lower half of the range.

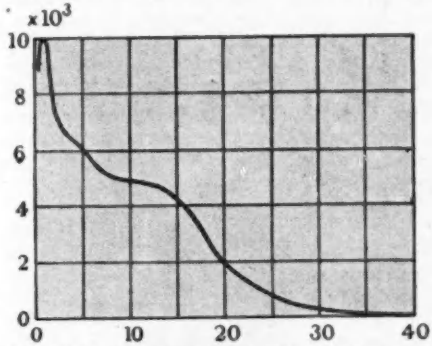


Fig. 1. The consumption, in kWh, with load in a given 0.5A sub-range plotted to a base of individual consumer's load in amps

When an attempt is made to relate individual consumers, loads to consumption in a given range the curve shown in Fig. 1 results. This leaves no doubt about the relative importance of the smallest loads, those up to 1 amp, and it emphasises the importance of not over-metering.

The conclusions reached from this work are necessarily tentative pending further tests to be made in other parts of the country, but they have considerable importance. Consumption at relatively low currents has a great importance both quantitatively and also because of the high monetary value of such consumption if taken without exceeding the primary block of block tariffs.

When considered on a basis of meter rating the position changes somewhat, as only about 13% of the total consumption was taken, while the load did not exceed 10% of the normal meter rating. Nevertheless, there is evidence of some over-metering, and also some support for differential treatment regarding service hours for the lower rated meters.

DISCUSSION

MR. O. HOWARTH (North Western El. Bd.), who opened the discussion, referred to the suggestion that a 20 amp meter should be included and said that the problem had to be faced of the reliability of the information which was available when a decision was made upon the size of meter to be installed. That decision was not made by meter people but by district staff who must have some rough and ready formula on which to determine the rating to be used. The more ratings available, the greater the liability of error in determining the ratings to be installed.

MR. S. HOWARTH (Min. of F. and P.) pointed out that the assessment of the error of the actual registration was the crux of the problem, and was dependent on a wide number of variables. Statistical analysis would possibly supply the answer. If a correct appraisal of the matter were to be made, a knowledge of the general behaviour of meters with years of service was essential and should be obtained continuously in order to take account of changing circuit conditions and improved design.

MR. S. F. MUSSON (B.E.A.) said there were many advantages to the user and to the manufacturer in having one size of house-service meter, and there were many existing small-size meters which could be used for supplies such as offices, shops, small works, etc. If only one size of meter were used the manufacturer and the meter test-room staffs could concentrate on getting the best performance on the one type.

MR. M. WHITEHEAD (Ferranti Ltd.) asked that a somewhat broader view of the whole subject of metering should be taken. It would seem that the supply authority was interested not so much in the accuracy of individual meters. It was interested in the mean accuracy of groups, from a group of industrial consumers right down to the very large group of domestic consumers. On the other hand, the consumer was usually interested in only one meter, and since he paid for everything it was in his interest to have his metering at the highest economical level.

MR. H. S. PETCH (B.E.A.) said he thought that the trend in meter design would be towards that which would give adequate accuracy at loads which were above the maximum continuous rating. In his view the export situation should be considered in that connection with a view to taking for home use the meters which manufacturers could sell overseas.

MR. D. J. BOLTON (B.E.A.) said it was obvious that there must be many more sampling tests of the type described from which it should be possible to make up a sort of composite or notional load distribution and impose it—on paper—to a batch of meters of different makes. By some means of integration it would then be possible to work out the aggregate loss to the

undertaking, and by so doing on a number of different servicing periods a scientific basis would be obtained for assessing the economic length of the service period.

MR. S. A. DAINES (E.El. Bd.) said he felt there was a danger of 10-amp m.c.r. being used too frequently, and suggested that that capacity of meter should not be used where the installed load exceeded 3 kW, that is, 12.5 amps at 240 V, always assuming there was no specified overload characteristic of meters to be taken into account.

MR. A. H. GRAY (Metrovick) referred to the legal aspect and said it was very interesting to note that there was a possibility of the introduction of a time function. If and when that time function were introduced he pleaded for a technique based on an engineering rather than on an accountancy basis.

MR. J. PRINCE (Ferranti) said he was always impressed by the emphasis given to the accuracy of electrical measuring, but to the consumer there was the second factor of the conversion figure, converting from units to money. The calculation of that conversion factor was a very complicated affair and could not always be achieved with theoretical accuracy. Comparisons of the inaccuracy between electrical measurement and the conversion factor should be shown and stipulated.

Producing Street Lighting Lanterns in U.S.

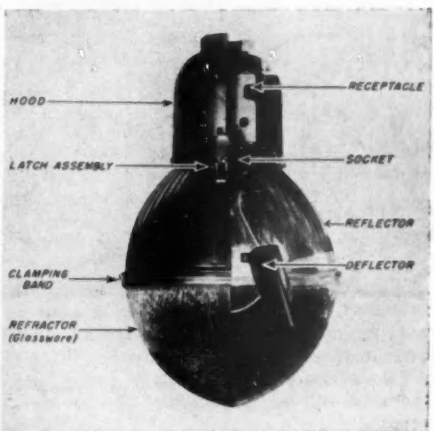
FROM time to time the Mutual Security Agency (successor to the Marshall Aid Administration) publishes reports of case studies of productivity and factory performance related to the manufacture of a specific article. These reports, although not aimed at replacing Productivity Teams, have the same basic intention, that of stimulating increased productivity. Such a report has recently been issued, dealing with Street Lighting Lanterns (Luminaries in American terminology).

Production Methods

In the report, production methods in three different factories are described for the manufacture of the lantern illustrated. Data, amassed from a questionnaire sent to each company, has enabled the manufacturing process to be broken down into detailed machinery and man-hours required for each operation in the manufacture and assembly of the lantern. Plant officials, having identified their factory with one of the three given, are invited to compare and contrast these performances with their own, the questionnaire being reproduced in the report for this purpose. Sections of comparatively poor performance may then be immediately isolated.

Of the three factories, one represents one of America's larger firms, in terms of industrial sales, manufacturing street lighting fittings as but a part of its output. The remaining two are medium-sized concerns, one specialising in lighting fittings generally but producing other electrical goods, and the other, although concentrating on lighting fittings, having a comparatively small proportion of its output in street lighting lanterns.

The lantern itself is a standard fitting accounting for over 50% of the value of output from the industry. Designed for use on series circuits, it differs from comparative English models in the provision of a receptacle, enabling the lamp to be removed without breaking the circuit. In its construction certain components are purchased, being available in standard sizes, and are machined to suit individual



A part cut-away view of the lantern discussed in the report

requirements, whilst others are machined direct from raw material. Size-standardisation of certain parts permits not only interchangeability of assembled components but allows the manufacturer to assemble such components, on a line production basis, for standard stock items in large volume.

Copies of this report may be obtained from the British Institute of Management, 8 Hill Street, W.1, price 5s.

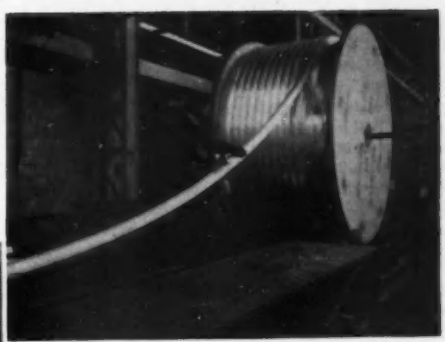
ALUMINIUM SHEATHING *for Cables at Kemano B.C.*

THE Rogerstone Works of Northern Aluminium Co. are manufacturing what is believed to be the largest aluminium cable sheathing yet produced. This is required for sheathing the paper insulated, hollow segmental, aluminium conductors which, operating at 300 kV, will convey the power from the underground power station at Kemano in British Columbia. Initially, the tube is provided in 400-ft lengths with an outside diameter of 4½ in. and a wall thickness of 0·17 in. As it emerges from the 8,000-ton Fielding extrusion press it is coiled on to a drum 12 ft in diameter and 6 ft wide with a 10-ft diameter barrel.

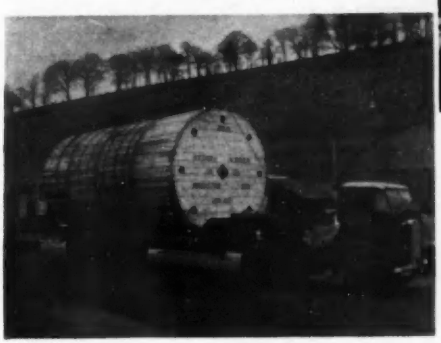
The press is the biggest in the country, and it is thought to be the biggest in the world. Built and installed by Fielding and Platt of Gloucester in 1942, it has produced some of the largest aluminium alloy extrusions ever made, most of them aircraft wing spar sections. The size of the billet container, some 20 in. in diameter, made possible the production of the 400-ft lengths of sheathing, each billet weighing about 1,450 lb.

The particular order shown being fulfilled in the photographs is for 20 lengths of tubing which will be shipped to the Aluminium Wire and Cable Co. of Canada for making up into the final cables. The diameter of the conductor to be sheathed is 3½ in., and that of the finished cable is about 3·85 in.

The large aluminium cable sheathing tube being extruded on the 8,000-ton Fielding press at Rogerstone Works. The tube has an outside diameter of 4½ in., a wall thickness of 0·17 in. and is supplied in 400-ft lengths



Coiling the 4½ in. diameter tube straight from the extrusion press on to the drum. Twenty such drums, measuring 12 ft in diameter and 6 ft wide, with a barrel of 10 ft diameter, were needed for the 8,000 ft of tube ordered



Some idea of the size of the drums required to hold the sheathing tube may be gained from this photograph showing four of them loaded on a trailer bound for Newport Docks

overseas news

B.C. Plan

Official approval to the long awaited hydro-electric development for the Columbia Valley has now been given by the British Columbia Government. Work on this project on the Spillimacheen River, is expected to start shortly. Its cost is estimated at over $2 million. The Columbia Valley is at present serviced by two diesel generating plants operated by the British Columbia Power Commission at Golden and Athalmer.

Another Scheme

The Great Lakes Power Corporation Ltd., Ontario, is another Canadian concern which is planning to further extend its generating facilities. It already has five hydro-electric generating stations with an aggregate capacity of 128,000 h.p. Preliminary work has now commenced on a further plant to develop about 15,000 h.p. about two miles upstream from the company's High Falls plant on the Michipicoten River on the north shore of Lake Superior.

More Plant Needed

Purchase of a third 1,000 kVA diesel generator to take care of emergencies and high peak consumption periods is being contemplated by the Orilla Water, Light and Power Commission, Ontario. The Commission has also been considering other methods of augmenting its generating capacity, and the suggestion has now been made that the Horseshoe Falls site, near Minden, should be developed.

Further Development

The British Columbia Electric Co., Ltd., has announced that it will spend $8 million on enlarging the Lajoie Dam on the Bridge River in the southern part of the province, making it one of the largest man-made dams in Canada. This enlargement means that the company's Bridge River power plant is to be further expanded in the near future. The height of the dam is to be raised from its present 225 ft level to 282 ft, and it will be lengthened to 3,390 ft. The addition will increase the output of the dam from 62,000 h.p. to 310,000 h.p. Instead of three, the dam will supply enough water to operate five turbines at the company's Bridge River plant all year round.

Another Try?

New financial and other conditions have been added to the specifications issued by the U.S. Corps of Engineers, in calling for new tenders for the supply of generators and transformers for the Chief Joseph Dam. It is reported that in the generator specifications a higher efficiency is being required, —97.9 instead of 97.4—,a minimum clearance between air coolers and generator housing of 18 ins., and magnetic amplifier type of voltage regulating system. The financial conditions require that the firm awarded the contract must put up a 20% bid bond and a 50% performance bond. Ostensibly the object of this is to enable the U.S. Corps to claim damages if their engineers decide that the firm which wins the contract does not ultimately fulfil all the specifications. (Such bonds were not asked for in the original specification, of course.) It has been pointed out that this amendment brings new difficulties for any British firm which will not have to be faced by the U.S. concerns. To obtain a bond the British firm must arrange with the U.K. Exchange Control to obtain permission for the bond to be valid in dollars as well as sterling. In London, it is considered that this will not be difficult, in the circumstances. But the English Electric Co. will already be considered by many to be at a disadvantage in this instance in that its tender price has been revealed; U.S. firms may now lower their own bids.

Atomic Power Development

Commercial development, through privately financed competition, of atomic energy for power generation is expected to follow a recommendation which is shortly to be made to Congress by the U.S. Atomic Energy Commission. In this it is suggested that the Federal Government should end its absolute monopoly on the possession and development of fissionable materials for the production of atomic energy. The way would then be open to private concerns to design, construct and operate reactors to produce power. It has since been announced that two private firms are to conduct a thorough study to determine how soon nuclear power can be used in industry. The firms are the Pioneer Service and Engineering Co. and the Foster Wheeler Corpn.

Control of Water Heaters

In order to ensure the best use of the generating plant under its control the Cape Town City Council has decided to install apparatus for the centralised control of domestic water heaters during peak periods. There are at present 40,000 water heaters connected to the Council's supply mains, and to gain experience one of eight areas is to be dealt with in this manner. The scheme will cost £41,000, of which £31,000 is for the necessary injection plant (manufactured by Metropolitan-Vickers Electrical Co.) and 5,000 ripple relays for installation in consumers' premises. It is stated that the facility will be of great assistance to the undertaking, particularly when purchasing in bulk from Escom later on.

Doubts in Bombay

In Bombay there have been reports that the State Government is now considering halving the generating capacity of the proposed thermal power station to be built at Trombay island, 8 miles from Bombay, by the Tata organisation, which was exclusively reported on July 3, 1952. Originally it was proposed that the station should have a capacity of 100 MW, with the first half in operation by 1956. But now it seems that some Government officials feel that a 100 MW station would be rendered superfluous with the inauguration of the Koyna hydro-electric project which is planned to have a capacity of 240 MW. A spokesman of the Tata Hydro-Electric Group of companies has denied this suggestion and expressed surprise at the turn of events. But discussions are still proceeding, apparently, and the Government is to give its final decision within the next few weeks. Details of the project and all preliminary work has been completed, and application for the necessary licence to proceed was submitted to the government last September. The spokesman added that until the Government made up its mind about the licence, the company could not proceed on the issue of raising domestic capital or the promised World Bank loan. The company could also order machinery etc. only after receiving sanction for the two stages of the project. Any attempt on the part of the Bombay Government to restrict the licence to the first stage, 50,000 kW, would upset the group's plans.

It's Cheaper by Electricity!

Bombay's electric crematorium, the first of its kind in India, is expected to be put into operation this month. The 12 ft high crematorium, constructed by the Bombay Corporation in the heart of the city, is now almost complete. The machinery, including two electric furnaces, has already been installed. The crematorium, which occupies a 2,000 sq ft area, is estimated to cost over Rs. 5 lakhs including the value of the land. The two furnaces, which "will ensure cheap, hygienic and quick cremation of bodies," if worked in two shifts each of 8 to 10 hours duration can dispose of 30 bodies a day. The cost per cremation will be 12 to 15 rupees, compared to Rs. 35 to 40 per cremation by firewood.

Electrification Retarded

The Queensland Government had been unable to obtain sufficient funds this year to underwrite the full works programme for Brisbane's suburban railway electrification scheme, Mr. Duggan, Minister for Transport, stated recently. But engineers are pushing on with the designing and planning work. He explained that, to ensure that money would be available to meet commitments for new locomotives and rolling stock and for other essential projects, it had been necessary to delete electrification from this year's programme and to curtail quadruplication of tracks. Full advantage was being taken of this year's financial provision for quadruplication works, he said, and of the £290,000 provided, £245,475 had been spent. The total amount expended on electrification and quadruplication so far was £782,933.

Progress

Tasmania has spent £38,000,000, or almost £130 per head of population, on the development of hydro-electric power, the Minister for Lands and Works, Mr. Reece, stated last month at the switching on of power ceremony at Nietta. Installed capacity of existing stations was 293,000 h.p. and, with the installation of three 35,000 h.p. machines, this would be increased to 398,000 h.p. by December, he said. By 1955 the Tungatinah and Trevallyn schemes would be completed and the installed capacity almost doubled to 580,000 h.p.

Rural Electrification

New consumers connected under the New South Wales Government's rural electrification scheme now total 30,000, it was stated recently. In the first quarter this year grants of £135,560 were made to 18 councils toward capital costs amounting to more than £250,000 This provides for nearly 1,000 new consumers, including about 700 farms. This is a healthy step nearer the stated target of having 70% of all farms electrified within the next eight years. Grants for electricity extensions this year represent a capital cost of £266.708.

Maraetai Build-up

Following the removal of two temporary flumes used to carry surplus water through the dam and powerhouse in the early stages, work has now begun on the installation of a fourth generator at the Maraetai hydro-electric power station of the State Hydro-Electric Board, in the North Island, New Zealand. There remains a further set to be installed, and it is hoped that the station will be generating its full 180 MW before next winter. In recent weeks the level of the Maraetai lake has been steadily raised, and a few days ago reached 600 ft above sea level, only 26 ft from the final operating level. The three generating sets so far installed are not all operating at their full capacity, and output of the station has been averaging about 84,000 kW for some time now.

Volcanic Power Now

A Japanese electricity company has applied for Government permission to generate electric power utilising the hot volcanic lava beneath Japan's thin earth crust, it is reported. The Kyushu Electric Power Co. expects to produce power within two years from a £200,000 sterling plant on Kyushu, Japan's southern island. The plan is to force water into long holes drilled near hot lava about 200 feet beneath the earth's surface. The resulting steam produced will operate the generators.

PERSONALITIES

IN THE INDUSTRY

Assistant manager of the London office of Metropolitan-Vickers Electrical Co., Ltd., for the past twelve months, **Mr. E. Mead,** B.SC.(ENG.), M.I.E.E., has been promoted as manager of that office in succession to **Mr. J. I. Law-Brooks,** who has relinquished that post but will continue to carry out certain special duties and remain available for consultation till the end of 1953. Mr. Mead obtained his early training at Brighton Technical College and joined M-V as a college apprentice in 1925. From 1926 to 1933 he specialised in heavy switchgear, spending a short time with Manchester Corporation Electricity Department and also handling contracts for Russia and for the Central Electricity Board's 132 kV South-West Grid Scheme. In 1933 he became manager of the Stoke-on-Trent sub-office, during which time he was chairman and treasurer of the North Staffordshire Branch of the Association of Mining Electrical and Mechanical Engineers. In 1944 Mr. Mead was transferred to London, where he has been actively concerned with the B.E.A. and Area Boards. He became assistant manager, London office, in April 1952.

Mr. E. Mead

Mr. B. H. Dyson, general works manager of Hoover, Ltd., and director of Hoover (Washing Machines), Ltd., yesterday flew to Stockholm where he is to address today a conference of the Mekanforbund, Federation of Swedish Mechanical Engineering Industries, on "Productivity Measurement as a Means to Increase Productivity."

Burco, Ltd., announce the retirement of their London area manager, **Mr. H. Lewis,** who recently completed 24 years' service with the company. He will continue to reside at "Pasadena," 125 Halfway Street, Sidcup, Kent; no successor has yet been appointed, we understand.

Mr. J. T. Sharples, B.SC.(Tech.), A.M.I.E.E., recently resigned his position as engineer-in-charge of the Heating Element Department, Metropolitan-Vickers Electrical Co., Ltd., to take up an appointment as district engineer and manager (Northern Counties) with Barlow-Whitney, Ltd. He will operate from their new address, 32 Deansgate, Manchester 3 (Telephone No. Blackfriars 3851). Mr. Sharples received his technical education at Manchester University, taking an Honours Degree in Electrical Engineering, and spent 21 years on heating problems with his late company.

After 45 years' service in the Electricity Supply Industry, chiefly with the Eastbourne undertaking, **Mr. J. F. Baldwin** has retired. He started as a student with the Dover Corporation Electricity Department, and later spent periods with the Kent Electric Power Co. at Chatham and the Grays U.D.C. before going to Eastbourne power station in 1914. There he became power station superintendent in 1940, holding that position till 1948 when he was transferred to the South Eastern Divisional headquarters staff as technical engineer (operations).

Mr. E. J. Davies, sales director of the Wandsworth Electrical Manufacturing Co., Ltd., sailed in the *Queen Elizabeth* last week for an extensive business tour of the United states.

Mr. R. D. Hamer, vice-president and director of Aluminium Laboratories, Ltd., has been elected president of the Aluminium Development Association for the ensuing year. The new vice-president of the Association is **Mr. H. G. Hetherington** (who has just retired from the presidency), while **Mr. G. W. Lacey** was re-elected chairman of the Executive Committee.

Associated Electrical Industries, Ltd., announce that **Mr. W. A. Ankerson,** B.SC.(ENG.), A.M.I.E.E., has been appointed assistant to the chairman of the group. He succeeds **Mr. H. Boyd Brown,** B.SC.(ENG.), A.M.I.E.E., who has been appointed managing director of First Electric Corporation of South Africa. Mr. Ankerson started with Metropolitan-Vickers as a college apprentice in 1932. He later served at the Shanghai office, ultimately as manager, and in 1942 was seconded to the Australian General Electric Pty. as chief industrial motor designer. Later he went back to China but returned to England in 1949 as manager of the Dominions Division of M-V. Export Co. South Africa is the home of Mr. Boyd Brown. He served with M-V. Export Co. there and in Holland and England, and was sales manager of the Motor Department before joining A.E.I.

Mr. W. A. Ankerson

Mr. H. Boyd Brown

The Eire Government has re-appointed **Dr. T. A. MacLaughlin, Mr. J. M. Fay, Dr. H. Kennedy** and **Mr. J. A. Ryan** as members of the Electricity Supply Board for a further period of four years from May 1, 1953. Two new members, **Mr. J. P. Digby** and **Mr. T. MacMahon, B.E.**, have also been appointed for the same period. Mr. Digby is managing director of Pye Ireland, Ltd., and Mr. MacMahon is a former county surveyor. **Mr. R. F. Browne** continues to be chairman of the Board.

For exemplary conduct during the East Coast floods earlier this year, H.M. the Queen has made a number of awards to various individuals. Included in the list are several employees in the Electricity Supply Industry who received the Queen's Commendations for Brave Conduct for their outstanding efforts on that occasion. This recognition of their services goes to **Mr. J. J. Bullinaire** and **Mr. E. G. Butler,** turbine drivers, and **Mr. F. Gregory,** acting charge engineer, at Littlebrook power station, for their work when that station was flooded; to **Mr. J. W. Holling,** second assistant engineer, and **Mr. C. T. Skipper,** substation attendant, both with the Eastern Electricity Board, for ensuring the safety of the h.v. apparatus at Tilbury and King's Lynn respectively, and finally to **Mr. F. E. Westoby,** assistant engineer, with that Board at Southend, for maintaining electricity supplies in the Southend-on-Sea district.

Sailing in the Cunard liner *Britannic* tomorrow, May 8, for a six weeks' visit to Canada and the U.S.A., is **Mr. G. R. Browne,** managing director of M.T.E. Control Gear, Ltd. He proposes to meet both users and manufacturers of electrical control equipment in both countries, and will also visit the Toronto Fair.

Chairman of the North of Scotland Hydro-Electric Board, **Mr. Thomas Johnston** is now on an eight-day visit to Eire, chiefly to study the generation of electricity from peat fuel. He is visiting the Electricity Supply Board's Allenwood turf-fired power station, and several of the Turf Board's installations.

The North Western Electricity Board announce that they have appointed **Mr. Frank Jasper Cole,** M.I.E.E., M.I.Mech.E., at present manager of the Board's No. 7 Sub-Area (centred on Stockport) as manager designate of their No. 3 Sub-Area (based on Oldham) to succeed **Mr. Edward Binns,** M.I.Mech.E., A.M.I.E.E., who retires in November after 40 years' service in the Electricity Supply Industry. **Mr. James Mills,** A.M.I.E.E., A.M.I.Mech.E., A.M.C.T., M.Inst.F., at present the Board's Purchasing Officer, has been appointed manager designate of No. 7 Sub-Area to succeed Mr. Cole. Mr. Binns had lengthy experience at Oldham before nationalisation, eventually becoming chief engineer and manager of the undertaking there. Mr. Cole, too, had wide experience as chief electrical engineer and manager to Shipley U.D.C., borough electrical engineer at West Bromwich, and in the same capacity at Blackpool from 1945 to 1948. Mr. Mills is another former borough electrical engineer—he held that post at Bury, Lancs, for two years before nationalisation. Earlier he was with St. Helens, Bradford and the Lancashire Electric Power Co.

Mr. E. Binns

Mr. F. J. Cole

Mr. J. Mills

The managers of the Royal Institution have appointed **Sir Lawrence Bragg, F.R.S.,** to the offices of Fullerian Professor of Chemistry, Resident Professor, and Director of the institution's laboratories. He will take up the duties of the Fullerian professorship immediately and the laboratory and resident duties on January 1, 1954. Sir Lawrence Bragg has been Cavendish Professor of Experimental Physics, Cambridge University, since 1938. At the annual meeting of members of the Royal Institution **Lord Brabazon** of Tara was re-elected president. **Dr. L. H. Lampitt** was elected treasurer and **Mr. S. Robson** secretary.

Mr. C. T. Baldwin, M.A., A.M.I.E.E., has recently taken up the post of Head of the Electrical Engineering Department at the West Ham College of Technology. He was previously a senior lecturer at the Northampton Polytechnic, London, and has also held teaching posts at Leicester College of Technology and Manchester University. His industrial training and experience were obtained with the Metropolitan-Vickers Electrical Co. at Trafford Park, Manchester. He is a graduate of Cambridge University and author of the recently published *Methods of Electrical Measurement*.

W. T. Glover and Co., Ltd., have appointed **Mr. W. Dudley Morgan** as their district manager, South West of England, and he will be located at the Bristol office. Mr. Morgan was previously branch manager of the Hotpoint Electric Appliance Co., having opened the Bristol branch for that company in 1933. He was educated at the University and Technical College at Cardiff and after completing the 3-years' course and obtaining

the Joint Diploma in Engineering of the two colleges, he joined the General Electric Co. and was later with Standard Telephones and Cables.

Mr. A. T. Hesmondhalgh has resigned from the board of Midland Electric Manufacturing Co.

Due to advancing years, **Mr. George P. Joseph** has relinquished the offices of chairman of Murex Ltd. and Murex Welding Processes Ltd., and **Sir Arthur J. G. Smout** has accepted an invitation to fill the vacancies. Mr. Joseph will continue as a director of the company and its subsidiaries. Mr. Joseph has been associated with Murex Ltd. since its inception in April, 1908. He held the office of chairman of the board of Murex Ltd. and its predecessor, Murex Co., Ltd., since 1915.

OBITUARY

Mr. A. L. Lunn, M.I.E.E., M.I.Mech.E., who was electrical engineer (generation) London Transport, from April 1937 until retiring in September 1948, died on May 2, aged 69.

His early experience was gained with Manchester Corporation Electricity Department which he joined in 1906, but in 1910 he went to Sunderland as engineer-in-charge. Returning to Manchester in 1915, he became turbine house superintendent in 1917, and later successively held the posts of assistant resident engineer, resident engineer, superintendent of power stations, and deputy chief engineer. This latter post he left in 1930 to join London Electric Railways as deputy electrical engineer. From January 1934 to April 1937 he was electrical engineer (Underground section) London Transport. A past chairman of the I.E.E. North Western centre, he served on many committees, and was also the first president of the E.P.E.A., an office which he held for two years.

Mr. A. L. Lunn

Mr. P. W. Laverick, A.M.I.E.E., chairman and managing director of Line Equipment Ltd., died on April 28, aged 61. He was for many years associated with the Electric Control Co., which later became Allen West & Co., Ltd., and was a founder director of Switchgear & Equipment, Ltd. In 1946 he founded Line Equipment, Ltd., and his technical ability and tireless energy has been greatly responsible for the building up of the present successful organisation of that company.

Mr. A. P. Binns, B.Sc., M.I.E.E., who was manager of the retail supply branch of the Hydro-Electric Commission of Tasmania, died in Hobart on April 15, aged 64. Born in Yorkshire, he went to Tasmania as a young man, and was associated with the electricity undertaking of the Hobart Gas Co. before he joined the Commission as a junior assistant in 1915. He took an active part in promoting the supply of electricity to people in the country districts.

The death occurred recently of **Mr. G. P. Tutcher,** F.C.I.S., who was the first secretary of the South Wales Electrical Power Distribution Co., Ltd. He retired in 1931.

NEW LITERATURE

The Future of Nationalisation

by H. A. Clegg and T. E. Chester

In the past few years there has been a spate of books and pamphlets on the organisational structure of nationalised industries. The present work, however, is one of the most thorough in its analysis of basic problems, and does reach constructive conclusions in the way of suggested reorganisation. The review of the evolution of thought on nationalisation is more fundamental than most of such similar surveys, and the description of the respective organisations that have been set up is more searching in its study. In the analysis of the problems of organisation also, the text is commendable but unfortunately nationalisation has many more problems than those surveyed; indeed, only the basic factors are considered which affect the main thesis of the authors.

While all nationalised industries are included, the reorganisation of the electrical industry is typical of their far-reaching line of thought. Broadly, the powers of the B.E.A. should be curtailed to much the same level as those formerly exercised by the C.E.B., while the Electricity Commissioners would be reinstituted to advise the Minister. Area boards would operate power stations under direction and each would raise its own capital under control. In the main, sub-areas should be abolished and the board would fulfil to some extent the functions of a parent company, with full operational power granted to the districts or their equivalent. These proposals are certainly far-reaching in their effect, and in consequence the authors favour an evolutionary approach. They present a well-argued case for their beliefs which is a valuable addition to the study of large scale organisation. Published by Basil Blackwell, 212 pages, 7¼ in. by 5 in. Price 12s. 6d.

BOOKS RECEIVED

Office Administrative Practices. A survey of current practice in 323 firms. Published by the Office Management Association, 40 pages, 9½ in. by 6 in. Price 12s. 6d.

Ironing, by Miss Elizabeth Allan. First number of a practical guide. Published by Morphy Richards Ltd., 36 pages, size 9 ins. by 7 ins. Price 1s.

The BUYER'S *Column*

The "President" Polishes Well

LATEST F.P.532 model floor polisher by BYLOCK ELECTRIC LTD., South Street, Enfield, Middx., makes its debut at the B.I.F.

The "President" of polishers

This three-brush polisher is listed complete with one set of burnishing pads at £16 17s. 6d. It has many outstanding points to promote its ready acceptance. A one-third h.p. motor housed in a ventilated frame casing operates by noiseless friction drive the floating bristle brushes which can be released if required by simple snap action. The motor and brush mechanism is concealed in a case finished in wine and grey durable non-chip enamelling protected by rubber bumper guards and low set for polishing under furniture. The polished column which supports the all-insulated grip handlebar is connected to the motor unit by snap locking fork.

13-amp Plugs and Sockets reduced in price

FOLLOWING the publication of B.S. 1363: 1947, featuring 13-amp plugs and sockets for ring main wiring, these accessories have been in great demand for incorporation in the installations of new buildings under the housing drives.

M.K. ELECTRIC LTD., Wakefield St., Edmonton, N.18, immediately followed up the specification with the introduction of their designs of plug socket and have, we understand, been working hard ever since then to meet the demand.

To help the housing drive even further M.K. Electric have now substantially reduced, as from May 1, the prices of their accessories, which now appear as follows:—

List No.	Description	OLD	NEW
727/646	Surface, sockets and plugs: brown	Doz. 91/8	Doz. 86/-
	white	106/8	95/8
728/646	Surface, sockets and plugs: two-gang, brown	182/-	170/-
	two-gang, white	—	188/-
730/646	Flush, sockets and plugs: brown	91/8	86/-
	white	106/8	95/8
731/646	Flush, sockets and plugs: two-gang, brown	177/-	170/-
	two-gang, white	207/-	188/-
2959/646	Surface switch socket-outlets and plugs: brown ...	Each 10/8	Each 10/-
	white ...	12/4	10/10
2957/646	Flush, switch-socket-outlets and plugs: brown ...	10/8	10/-
	white	12/4	10/10
		Doz.	Doz.
646	Fused-plugs: brown ...	42/-	40/-
	white	48/4	44/-

Now a Porcelain "Auto-perc"!

A FULLY automatic coffee maker in porcelain has been produced by FALK STADELMANN AND CO. LTD., 91 Farringdon St., London, E.C.1.

This new appliance, representing a new development in the domestic appliance field, has been designed by the company to match in, as our photograph shows, with traditional china coffee services.

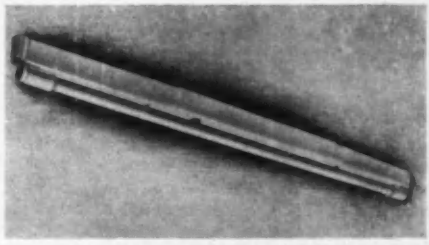
The new "Auto-perc" is graceful

Technical features of the "Auto-perc" are already known to our readers—it brews coffee automatically, switching off when the coffee is made, and afterwards maintaining the correct temperature. Loading of the new appliance is 560 W and its price £6 19s. 6d., no purchase tax.

Inexpensive "M-V" Batten Fitting

AN inexpensive 5 ft 80W fluorescent fitting complete with gear at £5 10s. is being marketed by METROPOLITAN-VICKERS ELECTRIC CO., LTD., St. Pauls Churchyard, London E.C.4, as from the beginning of this month.

Constructed of heavy guage sheet steel, bonderized and hot sprayed stoved white enamel, the fitting comprises a metal tray holding the gear to which the cover is attached by two knurled screws. This cover carries two white moulded plastic turret type lampholders with removable end-covers, permitting relamping from either end of the fitting. Overall dimensions are length 65¼ in., depth including lampholders 4⅞ in., width 4¼ in., fixing centres 24±⅜ in. and weight is 13⅜ lb. Erection of this fitting is said to be extremely simple.



An inexpensive Batten fitting

Becker Shuttered Switch-plug

ANOTHER product to be marketed by GEO. BECKER LTD., Ampere Works, Northend Road, Wembley Park, Middx., is a new 5-amp 3-pin front entry shuttered switch socket. The firm point out the following features in support of their design: (1) The switch has q.m.b. action suitable for a.c. or d.c. supplies; (2) that the unit conforms as required to B.S. 546; (3) that there is ample room at the bracket of the unit to facilitate wiring; (4) that the earth pin of the plug will not operate the shutter unless the other pins are in position; and (5) that the unit, which is supplied complete with "fingershield" plug, is small and neat in appearance.

Becker's new switch-plug is small and neat

"Monobloc" Built Diesel Sets

FEATURED by DALE ELECTRIC (YORKSHIRE) LTD., Filey, Yorkshire, at the British Industries Fair (see ELECTRICAL TIMES, April 23) is a new diesel generator set of "Monobloc" construction.

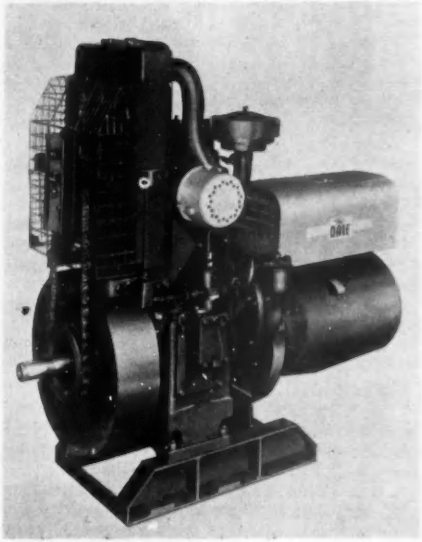
Available as a 3 kVA or 6 kVA unit, this Dale plant is notable in that, manufactured in the U.K., it has, we understand, Canadian Standards approval.

Engine and alternator are mounted on a common bedplate of rolled channel steel. The diesel engine is a direct injection model and is coupled to a drip-proof fan ventilated alternator which is, the firm say, self-excited and self-regulating with starting windings and a battery charging circuit. The alternator can be removed from the engine very easily and quickly without disturbing other components.

All relays in the switchboard are mounted to facilitate easy servicing. Should the set fail to start through lack of fuel or any other reason, an automatic cut-out prevents excessive drain on the batteries.

The set can be arranged for automatic starting, for remote control, or simple hand starting, and is normally for 240 V a.c. single-phase 50 c/s supplies.

"Monobloc" construction is notable in this set



TRADE PUBLICATIONS

STEEL RESEARCH.—An interesting brochure has been published by the United Steel Companies, Ltd., 17 Westbourne Road, Sheffield 10, which deals with the company's new Central Research and Development Department at Swinden Laboratories, Rotherham.

SCIENTIFIC INSTRUMENTS.—A new catalogue featuring the scientific instruments currently produced by W. G. Pye and Co., Ltd., is now available from that company at "Granta" Works, Newmarket Road, Cambridge.

STRIPPING AND CLEANING.—Technical literature is now available on request from the Orcene Co., Ltd., Victoria Street, Warwick, dealing with paint and enamel strippers (including synthetic lacquers) and emulsion cleaning in spray washing machines.

THERMAL STORAGE.—Many of our readers will find interest in a new brochure issued by G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs., dealing with "Autolec" thermal storage systems.

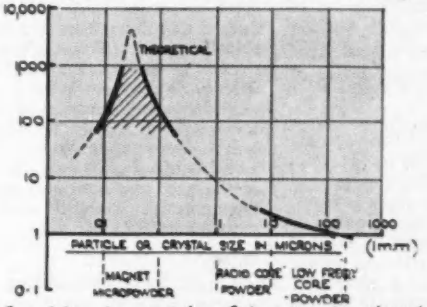
GEAR LUBRICATION.—Technical information so admirably presented that it will be of great interest to all engineers, whether or not their forte is gears and gearing, is an apt description of a new brochure No. 6 in the Vacuum technical series published by the Vacuum Oil Co., Ltd., Caxton House (East), Tothill Street, S.W.1. Profusely illustrated and including many of those accurate sectioned drawings so dear to the engineer, the brochure gives very comprehensive information on this important subject.

IRON CASTINGS.—An illustrated brochure containing an interesting survey of the Ferranti Foundry, with some examples of its products comprising light repetition and heavy grey iron castings, Nomag and NoduMag ductile cast irons, is available from Ferranti, Ltd., Holinwood, Lancs.

MAGNETS FROM METAL MICRO-POWDER

ALTHOUGH the use of metal powder for magnetic cores is not new, recent developments in this field have resulted in new types of magnets moulded from iron and iron alloys in micro-powder form. Produced by the General Electric Co., these magnets have the superficially unusual property of high coercivity, in contrast to the much smaller value of low loss iron dust used in the radio industry.

This seeming enigma is explained by the rapid rise in coercivity of magnetic materials as their size is reduced to the order of magnitude of a magnetic domain. The curve reproduced below gives some indication of this change.



Coercivity, in oersteds, of iron powder plotted to a base of particle size

Even pure iron, normally regarded as the classic example of a soft magnetic material, may experience a rise in coercivity of up to 10,000 oersteds when the crystal size is reduced to between 0·1 and 0·01 microns, although so far the highest figure achieved experimentally is about 1,000 oersteds.

By using a reducing atmosphere of hydrogen, iron compounds may be broken down at low temperatures to obtain metallic iron in particles of the required fineness. Moreover, the use of chemical processes similar to those used in the production of low loss materials, iron alloys in micropowder form may also be produced.

From the micropowder, solid magnets may be manufactured by high-pressure moulding, the coercivity increasing in proportion to the specific gravity. In this fine powder form, however, the dust has a strong affinity for oxygen and it is only recently that these difficulties have been overcome to permit large-scale production. Salford Electrical Instruments, Ltd., are responsible for manufacturing techniques, producing magnets of specific gravity from 4 to 5 gm/c.c., an improvement of approximately 40% over most magnet steels. For purposes requiring a high remanence magnets may be fabricated from powder alone, thus obtaining a low material resistivity. On the other hand, using a binding medium permits this property to be fixed at almost any desired value.

The energy value of such magnets is determined by the alloy used and the best micropowder now available has a cobalt constituent of 30%, giving an energy factor of 1·7. This is equivalent, among conventional magnet steels, to Alnico. Chemically, high-quality cobalt steel is its nearest equivalent, and compared with the latter's energy factor of 0·95 and density of 8·1 gm/c.c., the micropowder constitutes an advantage of over 3 to 1 in raw material utilisation.

Micropowder magnets were initially developed and patented by the French metallurgical company, Société d'Electro-Chimie d'Electro-Metallurgie et des Acieries Electriques d'Usine, and "Gecalloy" micropowder magnets are being made under licence.

COMPARISON OF PROPERTIES OF COMMERCIAL MAGNETIC MATERIALS

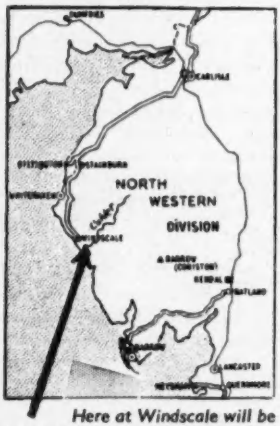
Group	STEELS		POWDERS		FERRITES	
Type	Magnet	Low Loss	Magnet	Low Loss	Magnet	Low Loss
Basic Material	Solid metal	Sheet metal	Metal micropowder	Metal powder	Mixed oxides	Mixed oxides
Physical Props.	Hard	Soft	Soft	Soft	Hard	Hard
Density gm/cc	7 to 8		4 to 5	5 to 7	4 to 5	
Resistivity	Low (conductor)		Low or high		High (insulator)	
Satn. Flux Dens.	High		Medium-high		Low	
Remanence	High		High-low variable		Low	
Coercive Force	Low-medium				High	
Construction	Solid alloy ground to size	Assembled laminations	Moulding to accurate size with inserts, pole pieces, etc.		Moulding, sintering and grinding to size	

The WEEK in NEWS

U.K.'s First Nuclear Power Station

Construction begins on Site in Cumberland

WORK is commencing on the construction of an experimental atomic power station. This was announced by the Minister of Supply last week, when he indicated that the site of the station would be Calder Hall, near the Ministry's existing atomic energy establishment at Windscale, Sellafield, in Cumberland. The likelihood of this step was referred to in these columns at the beginning of last month. The announcement follows a statement on the industrial uses of atomic energy which the Minister made to the House of Commons at the end of January. He then said that if an investigation then in progress showed prospects to be favourable, consideration would be given to building an experimental atomic power station. This would be based on an improved type of natural uranium reactor, in which the nuclear pile is enclosed in a pressure shell, and the heat generated is transferred via a gas under pressure through a heat interchanger. The remaining sections of the station would be of conventional design.



Here at Windscale will be Britain's first atomic power station. Map shows existing power stations and grid lines

Plutonium will be a by-product of such a pile, but it will not be breeding—i.e., it will have a limited fuel life. Development and design of breeder-reactors is proceeding. When he lectured at the I.E.E. earlier in January, Sir John Cockcroft, director of A.E.R.E., suggested that a natural uranium reactor power station should cost about the same as a conventional station, but that not enough was known about breeder reactor stations to allow a worthwhile estimate of cost to be given.

The Windscale establishment is concerned with the operation of atomic piles in which fission materials are produced from pure uranium. Operation of these piles has officially been described as involving a "very high" electricity consumption because of the fans necessary for cooling purposes. Thus the output of the proposed station will find a ready application.

Copper to be Freed on August 5

IT was announced by the Minister of Materials on Monday that private trading in copper will be restored at the earliest possible date. Notice has been given to Commonwealth producers, and from August 5 the private import and sale of copper will be allowed and the Distribution Order revoked. It is expected that the London Metal Exchange will re-open for dealings in copper on the same day. Thus the signs and indications of the past month or two and the popular forecasts have proved correct.

A.E.U. Tyne Committee Resumes Its Work

TYNE area committee of the A.E.U., which, as we reported three weeks ago, resigned because of a dispute with the national executive over men's wages, has resumed its duties. About 100 men at power stations imposed an overtime ban because a wage increase to unskilled workers brought their earning almost to the level of craftsmen. The executive would not support the ban. It has not been announced whether the overtime ban has been lifted.

The First Half-Century

The only successful method of capturing the small houses appears to involve some scheme of 'free wiring.' The landlords won't find the money, neither will the tenants; nor can the wiring contractors afford to raise—much less to sink—the heavy sums that would be necessary. There remains only the supply authority. If this be a company it can do as it pleases: if it be a municipality it can at present do nothing owing to the lack of borrowing powers; and so far the wiring contractors have fought tooth and nail against the granting of such powers. This opposition has arisen from the fear that the local authorities would start wiring departments and do the work direct.—*From our issue of May 7, 1903.*

Caribbean Trade Mission Issues Report

THE U.K. Trade Mission which visited certain Latin-American countries in the Caribbean towards the end of last year, under the chairmanship of Brig. W. H. Crosland, has just issued its report on the tour. During its six-week trip the team visited Venezuela, Colombia, Dominica, Cuba and Mexico, and the general impression brought back was one of confidence that there are considerable opportunities in all those countries for the expansion of British trade.

This is equally true of the electrical industry particularly, as it is of trade in general. Each of the countries has substantial development schemes in view and most concern, or at least involve, expansion of electricity supplies. Emphasis is laid, in the team's recommendations, on adequate representation in those countries.

Among the projects under consideration in Venezuela are lighting schemes for airports, irrigation schemes in conjunction with hydro-electric plant, and expansion of electric generating capacity and the supply distribution systems in more populated areas. Production and distribution of electricity is also high on the list of Colombia's future activities, while two irrigation projects coupled with hydro-electric generating plant are being considered in Dominica. Mexico too has similar projects in mind.

Prospects Better in S. Wales—Mr. L. Howles

PROPOSING the toast "The Electrical Industry," at the dinner following the E.C.A./S. Wales Board Liaison Committee's conference, Mr. L. Howles said he was hopeful that the changeover programme from d.c. to a.c. within the area would be completed in about four years. The chairman also referred to the difficulties facing the Board due to lack of generating plant, overloading of main transmission and shortage of capital. He added, however, that those problems were being overcome rapidly and it might soon be possible to concentrate on development. Other speeches were made by Mr. W. J. Creemer of W. J. Creemer Ltd., and Mr. L. G. Evans, the Board's West Central sub-area Commercial Officer.

A House-Warming at Brighton B

ANOTHER opportunity to view the progress being made in the building of Brighton B power station, was presented last week when an official "house-warming party" was held at the station. Foundations of this modern new station were laid in November, 1947. Now two 52·5 MW generating sets are running; two more should be completed by 1955, and a further two 60 MW sets are expected to be commissioned in 1957-58. Meanwhile work on the improvement scheme for Shoreham Harbour proceeds and tenders are expected to be in by the end of May. The house warming was attended by civic representatives from surrounding districts and officials of the B.E.A. executive and S. E. Division.

ENGLISH ELECTRIC'S DISTRIBUTION POLICY

THE Domestic Appliance Division of English Electric Co. Ltd., has announced that in future it will deal directly with the electrical retail trade, instead of distributing its products through wholesalers. This new system will be employed throughout the U.K. and Channel Islands, and operated as from May 1. Reason for this move is said to be to establish a closer contact between the company, its authorised dealers and customers. Arrangements for the distribution of television sets remain unaltered. Coincidental with the announcement comes the news that regional sales training schools are to be organised and the production of descriptive and helpful literature intensified.

25% Price Cut

A REDUCTION of up to 25% in the price of the complete range of Blackstone and Co., Ltd.'s diesel engines was announced last week by Mr. R. B. Lister, director. He said the decision had been made following the Chancellor of the Exchequer's Budget, with the object of giving a lead to the engineering industry, helping to stimulate home and export trade, and of calling a halt to inflating prices. The reduction applies to the home market, which, Mr. Lister said, had tended to be forgotten.

Mr. L. Howles, Board chairman, opening the E.C.A./South Wales E.B. Liaison Committee conference at Porthcawl. With him is Mr. R. L. Booth, chairman of E.C.A. S. Wales sectional board. Above is Mr. W. P. Warren giving his address on "Opportunities for Service to the Industrialist"

Electric Meters Outside Houses

AT a recent meeting of the N. Western Consultative Council it was suggested that electricity meters be installed outside houses. The idea is to be forwarded to the Board. Its object is to see if costs of meter reading can be reduced. The proposers maintain that much valuable time could be saved because readers would not have to grope in dark corners or make second calls on consumers. The suggestion has also been made by the American Productivity team which visited this country last year. The safety problem and possible robberies from prepayment meters, are two problems which would have to be solved.

1952 Appointments in Electrical Engineering

LAST year was another successful one for the Professional Engineers' Appointments Bureau. It is perhaps unfortunate that a lack of money should mar slightly an otherwise bright review of 1952. Reluctantly, the board has instituted an engagement fee to be charged to employers where an appointment results from the Bureau's nomination. No financial obligation will be incurred by notifying a vacancy unless a successful candidate is introduced. Notifications of vacancies in the electrical industry during 1952 numbered 234, and the total number of nominations among electrical engineers was 1,810. Enrolments at the end of 1952 were 1,975 compared with 1,679 in 1951, of which electrical engineers accounted for 474.

Four 3,000 h.p. and one 2,000 h.p. d.c. motors driving the five finishing stands at the steelworks of John Summers and Son, Ltd., Cheshire, which was honoured by a visit of H.R.H. the Duke of Edinburgh last week. The plant, much of which has been supplied by the English Electric Co., is part of a large-scale expansion programme being carried out at the works

U.K. WINS LARGE RADIO CONTRACT

AMERICAN defence contracts for radio transmitting and receiving equipment are mounting up in the files of Thorn Electrical Industries, Ltd. That company has recently secured another large order placed on behalf of the North Atlantic Treaty Organisation armed forces in Europe. Thorn's are to make a waterproof and bomb-blast-proof wireless receiver to operate from a.c. or d.c. mains or batteries within a certain voltage range, and which will not burst at high altitudes. The contract has been awarded by the U.S. Army under the Off-shore Procurement programme, and secured in the face of heavy competition.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS. *B.S.* 1975: *Primary Cells and Batteries for Intrinsically Safe Bell Signalling Circuits in Coal Mines: B.S.* 1916: *Part I: Limits and Fits for Engineering.*

MARKETS IN THE CARIBBEAN. Trade Missions Report. H.M.S.O. 4s. 6d. (see page 883).

EUROPEAN STEEL INDUSTRY AND WIDE-STRIP MILL. Published by U.N. (see page 869).

E.A.W. MIDLANDS CONFERENCE

ONE of the main functions of E.A.W. was to ease the housewife's burden by the introduction of labour-saving devices, but what were the members and other housewives doing with the time saved? This was the question posed by Dr. E. J. Findley, Medical and Child Welfare Officer at the Midlands and East Midlands area conference of the Association. The question was answered by Dame Caroline Haslett. She recalled Miss Pat Hornsby-Smith's gratitude for gifts of all kinds which had been given to hospitals and institutions; she referred to representations made for the abolition of purchase tax; and she also reminded the questioner of the E.A.W. surveys to suggest improvements in design, many of which are now beginning to have effect.

Development over the past 50 years was the subject of an exhibition run in conjunction with the conference. There was a comprehensive display of cookers, refrigerators, vacuum cleaners, laundry equipment, and numerous other domestic appliances.

The British Electricity Authority has chosen this design for its private standard. The flashes in white and lettering gold on a blue background

E.D.A. Sales Conference Next Week

THE 1953 Electricity Sales and Service Conference organised by E.D.A. is to take place at Caxton Hall, Westminster, on the four days from May 12 to 15. We note that the programme is, as usual these days, a full one, although well spaced. On each of the first three days there will be two papers with an additional lecture on "The Presentation of 16-mm Films" on the Thursday evening.

The first lecture, on Tuesday, will be given by Mr. W. Gilchrist on "Load Factor Improvement," while in the afternoon Messrs. W. E. Swale, J. M. Smillie and G. L. Tomlinson will combine to give "Basic Data in Commercial Development." On Wednesday, Mr. A. O. Johnson and Mr. D. G. Gwyn will talk on "Consumers' Repair and Maintenance Service" and "Recent Industrial Developments." "Electricity on Display," by Mr. N. F. Phillips, and "Farm Electrification," by Mr. C. A. Cameron-Brown, will occupy Thursday morning and afternoon. The conference will close with a general discussion, and luncheon at the Café Royal on May 15.

Other events include a visit to the Royal Festival Hall, and to the Lighting Service Bureau for Thursday evening's lecture.

Induction Heating

AN exhibition of induction heating is to be staged at the industrial showroom of the Midlands Electricity Board at Aston, Birmingham. The Board is organising the display in conjunction with Delapena and Son, Ltd., and an invitation has been extended to industrial consumers, and others interested in the process, to visit the demonstrations and displays between May 11 and 15.

Modern Publishing at Batti-Wallahs' Lunch

SOME secrets of the publishing trade were revealed to the Batti-Wallahs' Society last Wednesday when Mr. J. A. White, managing director, Methuen and Co., was principal speaker. He contrasted the difference between publishing methods of Dickens' time and today.

The main difficulty with technical books was to find suitably qualified authors who were not attached to one of the big combines or companies, and who had time to produce useful and authoritative works.

Scientific books, he thought were in some ways easier for publishers, as they could be sold anywhere in the world.

The next luncheon has been arranged for May 27.

S. WALES ENGINEERS' JOINT CELEBRATION

ENGINEERS in S. Wales are planning a joint dinner and dance at the City Hall, Cardiff, on June 12, to celebrate the Coronation. The event is being sponsored by the Council of the S. Wales Institute of Engineers, one of 13 kindred engineering societies in the area. We understand that the Institute of Marine Engineers will be the only body not participating. It is probable that about 500 members will sit down to dinner, while some 800 members, wives and friends will attend the subsequent dance. Members of the I.E.E., I.E.S., Institute of Fuel, Association of Mining, Electrical and Mechanical Engineers, and others will attend.

Electricity on Show in Stoke-on-Trent

AN event of some significance took place in Stoke-on-Trent last week. It was an Electricity Exhibition staged by the local district of the Midlands Electricity Board—the first to be held in the city for 21 years. All manner of electrical apparatus was on show, latest labour-saving devices were demonstrated and a comparison made between old and modern kitchens. A similar comparison was made as regards radio sets.

General view of Chatsworth House, the Derbyshire home of the Duke of Devonshire, which has been floodlit completely. The grounds and gardens have been opened to the public and will remain so until May 17. Philips 140 W SO/H sodium lamps in Redhill and Reigate fittings are used. The rock waterfall (right) was floodlit with two Altrilux 500 W internal reflector lamps

Attractive new display piece designed to demonstrate Crompton Parkinson Ltd.'s Colourglaze lamps. Feature of this polished glass finish, in red, white, blue, yellow, and green, is that it does not collect dust or dirt

NEWS IN BRIEF

We understand that a demand for the appointment of a Royal Commission of Inquiry into the prices of gas, electricity and coke, will be made at the National Chamber of Trade's Annual conference.

About 170 members of the Engineer Buyers and Representatives Association from all parts of the U.K. dined at the House of Commons recently. Association president is Sir Herbert G. Williams, M.P.

Stockton-on-Tees branch of E. A. W. last week became the 23rd branch to celebrate its 21st birthday.

Half-yearly Court of Governors of Commercial Travellers' Benevolent Institution, will be held at Berners Hotel, London, at 12 noon on June 20.

Annual Policy Conference of the Electrical Trades Union is to be held at Clacton from May 11 to 15.

Further to our report last week of the new 275 kV Isolators for the B.E.A., we note that the design of the isolator and its associated earthing switch was due to the combined efforts of Ferguson Pailin, the G.E.C., and the English Electric Co.

"Electricity Aids the Gardeners" will be the theme of E.D.A.'s stand at Royal Horticultural Society's Show at Chelsea which opens on May 20.

A large-scale system of traffic lights has recently been installed at Ludgate Circus, London, by Automatic Telephone and Electric Co., Ltd. The junction caters for about 40,000 vehicles in a normal 12-hour period.

Council House Repairs

FOLLOWING a protest by the local Trades Council, the scheme, whereby electrical repairs in houses were carried out by Haslingden's Lighting Dept., has been dropped. The local authority recently agreed that the system for repairs should be renewed for a further year. The Housing Committee has now recommended that electrical repairs should be done by local contractors or the Area Board.

Metrovick Meters

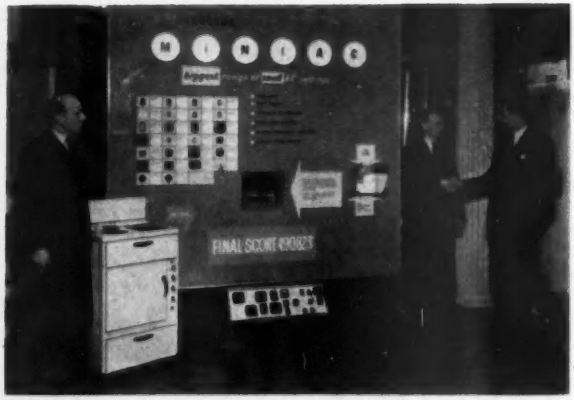
A CAPTIONING mistake occurred in our report of the Physical Society's Exhibition (April 16 issue) where a Metrovick meter was described as a "reactive power measuring equipment." This instrument was a "3-phase kVA indicator, type WD."

£500 can be Won in Display Contest

DEALERS in Prestcold Refrigerators have the opportunity between May 4 and 16 of winning prizes valued at £500 in a new display competition organised by the manufacturing company. Photographs of the display must be received at the firm's Cowley (Oxford) office by May 25. The contest has been divided into three classes—for Prestcold domestic refrigerator dealers, for departmental stores, and for electricity board showrooms. Cash prizes of £100, £30 and £20 will be awarded to the first three in each section.

437,000 WAS THE WINNING NUMBER

THE many visitors to Simplex Electric's stand at the Electrical Engineers Exhibition in March who recorded their guess in Lundberg Miniac switch competition, will probably like to know that the switch completed a total of 440,823 operations plus the 50,000 life test under B.S. 1299. The nearest guess was made by Mr. C. Pickard, asst. commercial engineer in the Tunbridge Wells district of the S.E. Electricity Board, whose figure was 437,000. Mr. Pickard's prize is a Creda cooker. Five runners-up each received a Halo iron.



Mr. Pickard being congratulated by Mr. E. G. Plucknett of Simplex with the competition switch and the result of the test displayed alongside

Questions in Parliament . . .

Iron and Steel Freed

Mr. Duncan Sands, Minister of Supply, announced on Tuesday that the Government had decided that, with the exception of tinplate, statutory control of the distribution of iron and steel should be brought to an end. This operated from May 6.

Farms Connected in S.W. Scotland

A number of questions were asked on Friday about the percentage of farms connected in the S.W. Scotland Electricity Board's area. Mr. J. Stuart said 100% of farms had been connected in the Glasgow sub-area, 83% in Clyde, 73% in Lanarkshire, and 62% in each of Ayrshire and Dumfries sub-areas. During 1952-53, 683 farms (67%) had been supplied in S.W. Scotland, and 262 farms (73%) in Lanarkshire. These figures compare with the 1951-52 figures of 532 (60·49%) and 100 (64·25%) respectively.

One Welsh Authority

In reply to Mr. Gower's enquiry about the setting up of a single Electricity Board for the whole of Wales and Monmouthshire, Mr. G. Lloyd said that as at present advised no changes in the existing organisation were contemplated. The questioner drew attention to the fact that in Wales there was a predilection for an organisation like that of the gas industry, which had provided Wales with an efficient board of its own. The Minister agreed but pointed out that the gas and electricity industries were considerably different.

Freedom of Choice

The Minister of Fuel and Power agreed to ensure that the principle of free consumer choice was maintained between gas, electricity and solid fuel for domestic use, in carrying out the recommendations of the Ridley Report. Following this question by Mr. Palmer, Mr. Nabarro pointed out that such competition was only possible where price was properly related to costs. He asked what was being done in the matter, particularly as regards the electricity supply industry? Mr. G. Lloyd said he was in touch with the nationalised industries on the subject.

Chief Joseph Dam

Both Mr. Palmer and Mr. Albu asked the President of the Board of Trade about the Chief Joseph Dam contract last week, with reference to the low tender originally submitted by the English Electric Co. Replying, Mr. Mackenson, the Parliamentary Secretary, added little to earlier statements. He said that the U.S. Government had informed H.M. Government of their decision, but had given no official reason for the rejection of the tender. H.M. Government had not sought from the U.S. Government any assurance that if the English Electric Co. won the contract at the next stage, there would be no further interference. At the end of the series of questions Mr. Palmer expressed his dissatisfaction with the reply, and gave notice that he proposed to raise the matter on the adjournment.

Technological Studies

Mr. Butler stated last week that the number of scientists and technologists coming from the universities and technical colleges of Great Britain with degrees, H.N.C.'s or their equivalents was equal to one in 2,600 of the population.

Atomic Energy

Sir Winston Churchill announced in a statement early in the week that in order to secure rapid economical development in the field of atomic energy, both military and industrial, the Government had set up a Committee "To devise a plan for transferring responsibility for atomic energy from the Ministry of Supply to a non-departmental organisation, and to work out the most suitable form for the new organisation, due regard being paid to any constitutional and financial implications."

Members of the Committee are Lord Waverley (Port of London Authority), Sir Wallace Akers (I.C.I.) and Sir John Woods (English Electric). Sir Winston Churchill made it clear that overall policy must remain firmly in the hands of the Government. For some time to come almost the whole of the cost of atomic energy work will have to be met from public funds.

Road Accidents

Street lighting inevitably figured in a reply by the Minister of Transport to a question on road accidents on Friday. He said that since last June preliminary approval had been given to 52 schemes on trunk roads estimated to cost a total of £228,000. Loan sanction had also been authorised in respect of over 600 schemes. As regards flashing beacons, the Minister said a number are already operating in Birmingham and a start has been made in London. He hoped the beacons would be operating throughout the country by next winter.

Clarence Dock Power Station

In a written question to the Minister of Housing and Local Government, Mr. K. Thompson alleged that nuisance and discomfort was caused by smoke from the chimneys of the Clarence Dock Power Station. The Minister undertook to make inquiries.

Factories Report

Sir Walter Monckton assured the House last week that the annual report of the Chief Inspector of Factories for 1952 would be published as soon as possible. Mr. Edelman called attention to delays in previous years.

Company Activities . . .

Babcock and Wilcox, Ltd.

The group profit for 1952, at £1,418,449, is a reduction of £658,269 on the previous year's total, according to the preliminary statement. But the dividend is maintained at 18% with a final of 7½% and bonus 3%.

Brush Electrical Engineering Co.

The year 1952 was a difficult one for the group in certain directions. But Sir Ronald Matthews, chairman, makes it plain that this did not apply to the electrical engineering side. The productive resources of the Loughborough factory operated at full capacity throughout and a satisfactory order book has been maintained, he states. The diesel engine factories, particularly at Staines and Leeds, were those most seriously affected, apart from the drastic losses resulting from the Indian tube wells contracts.

Year to Dec.31	£ Trading Profit	£ Net Profit*	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	722,732	425,116	92	10	8/-	5/10
1949	2,017,756	614,382	66	10	7/4	4/10
1950	2,497,971	654,996	47	10	7/1	4/9
1951	2,641,450	543,997	41	10	7/10	5/5
1952	2,475,247	136,990	8	4	6/4	7/1

* Attributable to parent company.

T. Clarke and Co. Ltd.

The full report and accounts for 1952 indicate that this company is fully engaged, for work in progress at December 31 is valued at £1,257,223—an increase of £400,000 over the previous year's figure. Of the former total, the sum of £1,071,200 has been received on account. The reduction in the net profit last year is due to taxation absorbing an extra £22,600.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1948	21,609	4,779	8	10*	—	—
1949	22,390	6,700	11	10*	4/4	3/1
1950	30,783	8,235	25	18	4/5	4/-
1951	69,900	22,479	62	18	4/3	3/1
1952	60,467	10,245	24	18	3/9	3/5

* Tax free.

Hopkinsons, Ltd.

Export sales last year were a record for this company, although there has been a slight falling off in export orders, which are now more difficult to obtain in view of import restrictions, the directors state. The advances in practically all costs due to higher prices of raw materials and wages, have been more than offset by the increased turnover and efficient production. The material supply position, however, has not shown the degree of improvement hoped for, and certain items, particularly alloy steel, are still in short supply.

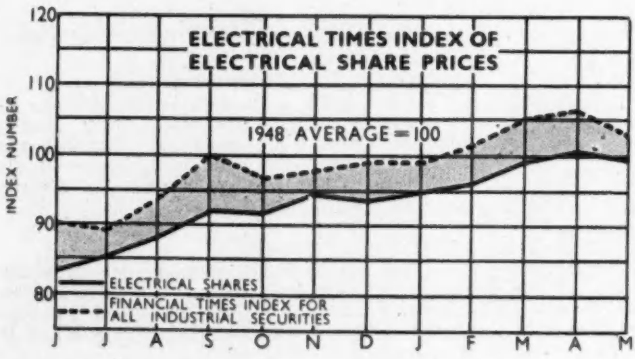
Year to Jan. 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1949	568,289	246,755	121	22½	5½	86/3
1950	627,688	275,162	140	22½	5½	87/6
1951	844,484	349,939	182	25	6 11/16	5 15/32
1952	799,291	345,380	180	27½	5 21/32	96/10
1953	837,887	350,137	176	32½	6 11/16	6

Wm. Sanders and Co.

For the year ended December 31 last the net profit, after allowing all charges, is £11,997 compared with £12,784 for the previous year. The dividend, too, is reduced by 5% to 20%.

Veritys, Ltd.

We referred last week to the substantial increase in the trading profit shown in the preliminary report. Our accompanying table further indicates the noteworthy improvement effected in recent years. There was a definite increase in productivity



Share price indices remained fairly steady during April, although both declined slightly. More marked fall was in the Financial Times index for all industrial share prices which dropped from 106·03 to 102·8. The Electrical Times figure for all electrical share prices dropped over the same period by 1·2 to 99·5. These figures are based on the average prices ruling during 1948

in 1952, following the rearrangement and concentration of production, Mr. H. B. T. Wilde, the chairman, states. The Enamelling Department has been rehoused in a building better suited to its needs, while the equipment has been modernised. The Control Gear Department has also been expanded.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	42,705	14,019	14	5	5/7	3/6
1949	21,042	4,126	4	2½	4/9	2/7
1950	10,355	–18,315*	—	—	3/9	2/10
1951	36,180	17,586	19	7½	4/4	2/9
1952	65,743	14,722	15	10	5/1	3/1

* Loss

The volume of export sales was 32% of total sales during the year. While the orders in hand at the end of December were sufficient for several months' work, and production has been maintained in the first three months of 1953, Mr. Wilde warns that there has been a sharp falling off in demand, and competition—both home and export—is growing.

Watford Electric and Manufacturing Co.

Output for 1952 was increased by approximately 22% and the gross profit is a record for the company, despite the unavoidable disorganisation occurring with building operations during the year. With the new, imposing office block in full occupation, a further 9,000 sq ft of factory floor has been released. Sales continue to be maintained, and 1953 has commenced with a very satisfactory order book, although competition is keener and customers are demanding much shorter deliveries, states Mr. A. C. Gasgoine.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	39,678	17,880	40	20	6/9	5/1
1949	37,552	16,851	36	20	6/10	5/6
1950	49,776	22,450	51	25	7/3	5/10
1951	58,600	23,210	49	25	8/3	6/-
1952	85,391	24,475	45	25	—	—

Dividends Declared

Anglo-Portuguese Telephone Co.—Dividend of 8% on "A" Ordinary (*same*).

W. Canning and Co.—Final dividend is 25% again, making a total of 35% for 1952. The net profit is £181,534 (*£163,262*).

Constructors Ltd.—Final dividend 20%, making 25% (*same*). Group profit after all charges except tax, £126,072 (*£111,497*).

R. and A. G. Crosland.—The dividend is again 22½%.

Louis G. Ford.—Final dividend 20% plus bonus 5% making a total of 35% (*same*). Net profit for 1952 is £39,515 (*£40,132*).

McMichael Radio Ltd.—Dividend is again 8%. Net profit for 1952 is £24,273 (*£22,186*).

Rawlplug.—Final dividend 40% plus bonus 5%, making 55% (*same*).

Electric Supply News . . .

Ferrybridge

Consent of the Minister of Fuel and Power to the establishment of a new section of the Ferrybridge power station, Yorkshire, has been received by the B.E.A. The new section, to be known as Ferrybridge B, will have an installed capacity of 300 MW made up of three 100 MW turbo-generators each served by a 755 klb/hr boiler unit. Three cooling towers, each of 4 million gal/hr capacity will serve the new section.

Isle of Man

The rural electrification extension scheme of the Isle of Man Electricity Board, providing for a supply to 133 farms at a cost of £107,167, to which we referred last week, was termed 'expensive' during discussion by Tynwald. Proposing the extension, Mr. J. R. Corrin, M.L.C., said it was a continuation of the Farm Electrification Scheme started some years ago. The first scheme had been adopted in 1948 and cost £50,000 for 300 farms, averaging £200 per farm. The second scheme was adopted in February, 1951, and covered 200 farms at an average cost of £380 each. The present scheme was expensive mainly because of the long lines of h.t. cable which had to be erected to the outlying farms. A member pointed out that some parts of the scheme were far too expensive to be considered. At Cronk-y-Voddy it was proposed to lay 5½ miles of cable to take in 31 farms, at a cost of £34,000. Eventually it was agreed that His Excellency be asked to consider the scheme with the Public Works Commission, and consider which parts of the project could be included in next year's estimates.

Monmouthshire

A proposal of the B.E.A. to build a power station at Lower Machen, Monmouthshire, has been rejected by the Minister of Fuel and Power. Opponents of the scheme at the public inquiry contended that it would ruin a beauty spot.

LIGHTING SCHEMES

Congleton.—T.C. has provisionally approved a scheme, estimated to cost £5,000, providing for the conversion to electricity of the gas lighting in the main streets.

Halifax.—The Highways Committee has decided to complete the schemes for sodium lighting in Bradford Road and Huddersfield Road.

Manchester.—The Highways Committee has approved proposals for new street lighting in Greyfriars Road, Woodhouse Park, Civic Centre Road, Wythenshawe; Brooklands neighbourhood (2 areas), and in certain other roads.

Commercial Information

CONTRACTS OPEN

HOME

May 8.—Roxburgh. Electrical work in infant dept. of Kelso High School. Names to County Architect, County Offices, Newtown St. Boswells, by above date.

May 9.—Aberdeen. Installation of electricity at Crudie school, Fintry school, Garmond school, Greeness school and Upperbrae school. Names by above date to James Munro, architect, Deveron Rd., Turriff.

May 9.—Aireborough U.D.C. Supply and installation of columns and brackets and fitting and wiring of lanterns, etc., for 250 W mercury discharge street lighting along A.65. Also supply of lanterns and auxiliary gear. Engineer and Surveyor, Council Offices, Micklefield House, Rawdon, Leeds. Deposit £2 2s. (See April 16 issue.)

May 9.—Chadderton U.D.C. Supply of 31 lanterns, etc., for 140 W sodium lamps, 23 same for 60 W sodium and 80 W mercury lamps, and 23 concrete columns. Engineer and Surveyor, Town Hall. (See April 23 issue.)

May 11.—Hoddesdon U.D.C. Installation of electricity in 122 houses. Engineer and Surveyor, Council offices. (See April 23 issue.)

May 12.—Belfast. Electrical lighting and power installations at St. Patrick's intermediate schools. M'Lean and Forte, architects and surveyors, 12 High St. Deposit £5 5s.

May 12.—Dublin. Supply of two complete electrically driven pumping units for N. Dublin Regional Water Supply scheme (contract No. 5). Council's Consulting Engineer, Nicholas O'Dwyer, 6 Burlington Rd. Deposit £5 5s.

May 12.—Middlesbrough T.C. Supply of electric lamps and unit dry cells, and street lighting columns during year ending June 30, 1954. Borough Engineer, Municipal Buildings.

May 14.—Belfast. Wiring for power to cooking and ventilating equipment at Ashfield Girls' grammar school. Education Architect's Dept., 40 Academy St.

May 14.—Northern Ireland. Supply and erection of two electrically-driven automatically controlled vertical spindle centrifugal pumps for Ballymacarratt drainage scheme, including control gear, wiring, etc. Chief Engineer, Ministry of Commerce (Transport Div.), 64 Chichester St., Belfast. Deposit £5 5s.

May 15.—Chorley (Lancs). (*a*) Supply, erection, etc. of 113 sodium lighting units and (*b*) supply of lanterns and electrical apparatus for same, along about 3 miles of trunk road A.6. W. Groves, Engineer and Surveyor, Council Offices, Gillibrand St.

May 15.—Dublin. Renewal of electrical distribution system in Hospital 3, St. Kevins' Institution. Nicholas Mathews, consulting engineer, 42 Fitzwilliam Place. Deposit £10 10s.

May 16.—Blackpool T.C. Supply of 75 concrete columns and 75 decorative fluorescent lanterns for street lighting. Illuminations and Public Street Lighting Officer, Electrical Services Dept., Rigby Rd. East. (See April 23 issue.)

May 16.—Salford. Supply of electric lamps and cables required during year beginning July 1 next. Street Lighting Superintendent, 9 Frederick Rd., Pendleton, Salford.

May 18.—Keynsham U.D.C. (*a*) Supply of 27 concrete and 7 steel columns and complete installation; and (*b*) supply of electrical equipment for street lighting along trunk road A.4. Engineer and Surveyor, Council Offices, Keynsham, Bristol. Deposit £2 2s. (See April 23 issue.)

May 18.—Southgate T.C. Supply of 134 140 W sodium lamps and 35 250 W mercury lamps for Group A street lighting on main roads. Also supply and erection of 168 concrete columns and fixing 169 lanterns, control gear, wiring etc. (separate contracts). Borough Engineer and Surveyor, Town Hall, Palmer's Green, N. 13. (See April 30 issue.)

May 18.—Sunderland T.C. Electrical installation in Hylton Red House junior school. Borough Architect, Grange House, Stockton Rd. Deposit £2 2s.

May 19.—Worcester. Electrical installation at Guildhall. City Engineer and Surveyor, 22 Bridge St. Deposit £2 2s.

May 20.—Wolverhampton T.C. Installation of sodium and fluorescent lighting in class A, and mercury and tungsten lighting in class B along certain streets. Borough Engineer, Town Hall. Deposit £2 2s. (See April 23 issue.)

May 22.—Belfast. Supply and erection of private automatic telephone exchange equipment. Electricity Dept., East Bridge St. Deposit £2 2s. (See April 30 issue.)

May 22.—Edinburgh. Electrical installation in 147 houses and 16 shops in Inch Development area B. City Architect, City Chambers.

May 25.—Farnworth T.C. Installation of electric lighting and heating in 189 houses on Plodder Lane South site. Borough Engineer and Surveyor, Town Hall. Deposit £1 1s.

May 25.—Galashiels T.C. Supply, erection and wiring of about 77 mercury discharge lighting points, columns, lanterns and accessories in Group A along Edinburgh-Carlisle trunk road. R. G. Nicholson, Lighting Inspector, Burgh Chambers. (See April 30 issue.)

May 26.—East Riding. Installation of electrical services at Institute of Agriculture, Bishop Burton. County Architect, County Hall, Beverley.

May 26.—Roscommon. Supply and erection of two electrically operated pumping units, with accessories, for Boyle water supply. P. H. McCarthy and Son, consulting engineers, 26 Lr. Leeson St., Dublin. Deposit £5 5s.

May 29.—Colne Valley U.D.C. Supply of equipment for 69 mercury lighting units; and erection of 69 lighting units and overhead wiring along A62 trunk road. Engineer and Surveyor, Municipal Offices, Carr Lane, Slaithwaite.

May 29.—Slough T.C. Supply and erection of electrically driven automatically controlled booster

plant, capacity 120 g.p.m., for waterworks. E. Gardner Thorpe, Borough Engineer, Town Hall.

May 30.—Bristol. Supply of electrical measuring instruments to Engineering Dept., College of Technology. G. H. Sylvester, Chief Educ. Officer, Council House, College Green.

June 1.—Alton U.D.C. Supply of three sets of electrically-driven vertical unchokable sewage pumps with ancillary equipment for treatment works pumping station. John Taylor and Sons, Artillery House, Victoria St., Westminster. Deposit £5.

June 1.—Bushey (Herts) U.D.C. Supply 80 concrete columns and 140 W sodium lanterns, lamps and ancillary equipment for improved street lighting along five roads. Engineer and Surveyor, Council Offices, Rudolph Rd. Deposit £2 2s. (Advertised in this issue.)

June 3.—Dublin. Supply and erection of (*a*) three vertical spindle sewage pumps and electric motors capable of pumping 646 g.p.m., and (*b*) two storm water pumps and electric motors capable of 1,400 g.p.m. Required for N. Dublin drainage scheme (contract No. 8). City Treasurer, Exchange Buildings, Lord Edward St. Deposit £5 5s.

June 3.—Manchester. Alterations and additions to electrical installation at Newton Heath Technical College. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

June 6.—Bredbury (Ches.) U.D.C. Supply and installation of 140 W sodium street lighting, including concrete columns, lanterns, lamps, control gear, etc., along 2¼ miles of A560 trunk road. Engineer and Surveyor, Council Offices, George Lane. Deposit £2 2s.

June 8.—Morley T.C. Supply and installation of sodium lighting along trunk road A.650. Street Lighting Superintendent, Town Hall. Deposit 10s. 6d. (Advertised in this issue.)

June 10.—Gateshead T.C. Electrical installation at Dryden Rd. grammar school. Applications to A. J. McGregor, Borough Surveyor, Municipal Buildings, Swinburne St., by May 18. Deposit £2 2s. (Advertised in this issue.)

June 19.—Belfast. Supply, erection, etc., of 110 kV and 33 kV main cables, auxiliary cables, etc., for Municipal power station to Donegall sub-station (N.1235), and 33 kV main cables and accessories for Stage 2 of 33 kV distribution system (N.1236). Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (Advertised in this issue.)

No date stated.—Girvan (Ayr) T.C. Electric lighting in 32 houses in Mote scheme. Applications to S. Valentine, Town Clerk.

No date stated.—N. of Scotland H.-E. Board. Erection of high and low voltage lines in Kincardineshire. Merz and McLellan, 39 Northumberland St., Edinburgh. Deposit £1 1s. (See April 23 issue.)

No date stated.—N. of Scotland H.-E. Board. Erection of high and low voltage lines in Banffshire. Merz and McLellan, 39 Northumberland St., Edinburgh. Deposit £1 1s. (See April 23 issue.)

No date stated.—Tranent T.C. Electrical works in erection of 26 houses on Balfour Sq. site. Names to Town Clerk.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horse Guards Avenue, S.W.1, quoting reference.*

May 20.—Pakistan. Supply of cable and cable pressure testing equipment and balancing sets. (Tender No. DB/XC-909.) Posts and Telegraphs Dept. B.o.T. (Ref.: CRE 13956/53).*

May 27.—Portuguese East Africa. Supply of 500 various items of electrical equipment for Ports, Railways, and Transports Dept., Lourenco Marques. B.o.T. (Ref.: CRE 12146/53).*

May 30.—Pakistan. Supply of miscellaneous electric cables, wires and cable boxes to various specifications under tender No. Eng-9/15578/3/53. Dept. of Supply and Development, Govt. of Pakistan. B.o.T. (Ref.: CRE 15289/53).*

June 9.—New Zealand. Supply of one 50,000 kVA, 220/110/11 kV transformer bank for Otahuhu substation. (Contract No. 222.) State-Hydro-Electric Dept., Wellington. Deposit £100, bond £1,650. Tenders also asked for similar transformer bank for Haywards substation.

July 6.—Australia. Supply, erection and maintenance of low-

Your Queries — Answered

"Cincinnati" grinders, agents for? J.J.—Chas. Churchill and Co., Ltd., Walnut Tree Walk, S.E.11. (25661)

Stocking-mending machines, makers of? H.G.—B. Toone and Co. (Nottingham), Ltd., Newdigate St., Nottingham. (25669)

"Armco" speed regulator for a forge fan, makers of? S.B.—We presume this refers to "Armor" made by General Electric Co., Ltd., Magnet House, Kingsway, W.C.2. (25679)

"Silentflo" hairdryers, makers of? T.E.—Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, N.W.9. (25685)

"Lyndon" taps and dies, makers of? B.B.—Tom Carrington and Co., Ltd., Lyndon Tool Works, Stony Lane, West Bromwich. (25692)

Recalibration and cleaning of instruments, undertakers of? E.E.—Instrument Repairs, Ltd., 10 Amwell St., S.E.1. (25709)

"Bescol Elephant" kettles, makers of? S.W.—Bescol Electric Ltd., Parkfield Rd., Saltley, Birmingham 8. (25716)

"Allen-Bradley" control gear, suppliers of? D.E.—Kempston Electrical Co., Ltd., High St., Kempston, Bedford, and Rocke International, Ltd., 59/61 Union St., S.E.1, can probably assist. (25729)

The above are selected from questions we have answered this week. If you have a query, send it to us.

CONTRACTS OPEN OVERSEAS— (continued)

tension switchgear, rating 25,000 kVA at 400 V, for Townsville Regional Elect. Board. (Spec. No. 386.) State Electricity Commission of Queensland, Scottish Union House Eagle St., Brisbane. B.o.T. (Ref.: CRE 14872/53).*

July 14.—New Zealand. Supply of 5,000 kVA, 33 kV, 3-phase, 50 c/s, voltage regulating transformer of outdoor type, oil immersed and with natural cooling, for State Hydro-Electric Dept. Deposit £100 and bond £160.

Aug 19.—Australia. Supply of materials, clearing of route, and erection of 132 kV overhead transmission line for State Electricity Commission of Queensland. Spec. T.F./16 available from Agent-General for Queensland, 409-10 Strand, London W.C.2. (Advertised in this issue.)

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	253 0 0	—
LEAD, good soft pig (foreign)... ...	80-80½	100 0 0
TIN (99·99·76%) ... ...(Cash)	740-742½	—
,, ... (3 months)	740-742½	—
ALUMINIUM, commercial purity (del.)	161 0 0	—
ZINC	68-68½	88 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	51 10 0	—
Mild Steel Tape (0·04 in.)... ...	40 0 0	—

CONTRACTS PLACED

B.E.A. Circulating water pipework, Aiton and Co., Ltd., and auxiliary cables and connections at Brunswick Wharf, London Electricity Board; two generator transformers at Tilbury, English Electric Co., Ltd.; 11,000-V and lower voltage cables and accessories at Skelton Grange, Drake and Gorham (Contractors), Ltd.; three reinforced concrete cooling towers and ancillary works at Stella North, Davenport Engineering Co., Ltd.; power, control and indication cables for two turbo-alternator sets at Chadderton, Enfield Cables, Ltd.; 132 kV 1,500 MVA switchgear at Wymondley Substation, Herts, English Electric Co., Ltd.; uprating of 132 kV 1,500 MVA circuit-breakers at Crumlin, Upper Boat and Ebbw Vale, Metropolitan-Vickers Electrical Co., Ltd.; and 275 kV twin 0.4 sq. in. double circuit overhead lines, Iver-West Weybridge-Melksham Balfour Beatty and Co., Ltd.

Durham. Installation of electricity in 320 houses, S. E. White, £4,965.

Manchester. Electrical installations in total of about 550 flats under various contracts, F. L. Bampton Ltd. Also same in shops and maisonnettes at Brooklands Main Centre, Wythenshawe, N. Western Electricity Board.

Newcastle-on-Tyne. Supply of mercury arc rectifier for Byker substation, Hackbridge and Hewittic Electric Co., Ltd., £8,595.

Rotherham T.C. Supply of 4 miles of trolley wire, British Insulated Callenders Cables Ltd., £1,785.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

M.P. Stainless Products, Ltd. T. J. M. Macleod, of 4 Bucklersbury, London E.C.4, has been appointed liquidator with committee of inspection.

Renas Engineering Co., Ltd., Croydon. Winding-up order dated April 27. Petition presented on April 10 and resolution passed on March 5.

B. and L. Hamilton, Ltd. Last date for receiving proofs in respect of intended dividends, May 16. Liquidator is F. M. Collins, Official Receiver Inveresk House, Strand, W.C.2.

D. G. Hall and Co., Ltd. Liquidators, H. S. Browning, 78 Queen Victoria St., S.W.1, and L. S. Findlay, 35 Windsor Place, Cardiff, released as from Dec. 2.

Voluntary Liquidation

Magstarlite Ltd., electrical and mechanical engineers, of London W.6. At statutory meeting of creditors statement of affairs showed liabilities £2,613, of which £1,636 was due to trade, etc., creditors, and £977 to loan creditors. Assets of book value of £3,655 were estimated to realise £1,961, and after allowing £299 for preferential claims, there were net assets of £1,662 or deficiency of £951. Unanimous resolution passed confirming voluntary liquidation with David Morgan, of Morgan and Co., 100 Park Street, Grosvenor Sq., W.1, as liquidator, with committee of inspection.

BANKRUPTCY ACTS

Receiving Order

Worcester. Harry Bullock, trading as H. Bullock and Sons, electrical engineer at 17 High St., Bromyard, Hereford. Date of receiving order, April 28.

Intended Dividends

Nottingham. Robert H. Bullough, trading as Hyson Radio at 12 Gregory Boulevard, Nottingham. Last day for receiving proofs, May 20. Trustee is E. C. Stimpson, Official Receiver, 22 Regent St., Park Row, Nottingham.

Bournemouth. Edward J. R. Tremlett, radio and electrical dealer, of 941 Wimborne Rd., Moordown. Last day for receiving proofs, May 21. Trustee is C. S. Dawson, Midland Assurance Building, Fir Vale Rd., Bournemouth.

Brentford. Basil F. Robbings, trading as Electric House at 1388 Greenford Rd., Greenford Green, and as Radio and Electric House at 81B Northolt Rd., S. Harrow. Last day for receiving proofs, May 12. Trustee is William J. Wallis-Hill, Official Receiver, 3 Central Buildings, Matthew Parker St., Westminster.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Advolt. B714,365. Class 9. Electrical apparatus for regulating and changing voltage. Advance Components Ltd., Advance Works, Back Road, Shernhall St., Walthamstow.

Demistafire. 714,875. Class 11. Electric heating elements. Tudor Accessories Ltd., Benlow Works Silverdale Road, Hayes, Middx.

Stat-arc in design. B.709, 707 Class 9. Metal arc rectifier welding apparatus. Hirst Electronic Development Ltd., 29 Dermody Road, S.E.13.

BUSINESS PROSPECTS

Basford (Notts) R.D.C. Construction of 56 houses on three sites. Engineer, Surveyor, and Housing Architect, J. J. G. Ellis, Rock House, Stockhill Lane.

Beckenham. S. M. Swanston, 15 Hawkhurst Way, West Wickham, Kent, is architect for factory proposed by Carr Bros. (Engineers) Ltd.

Belfast. Erection of 6 shops and 12 flats on Ballymurphy estate, and 92 dwellings on Clark Park estate. Housing Architect's Dept., 94 Chichester Street.

Carlisle. Carr and Co., Ltd., are to build additional two floors at their Jubilee works. Estimated cost between £50,000 and £60,000.

Cookstown (Tyrone). Plans approved for erection of 20,000 sq. ft. factory at Greenvale for S. J. Fisher and Co., Ltd.

Dover T.C. Erection of 42 houses at Aycliffe. Borough Engineer, Brook House.

Dovercourt. Sketch plans approved for Dovercourt Hill secondary school, estimated to cost £179,520.

Egham U.D.C. Erection of 66 houses and bungalows on 6 sites. Engineer and Surveyor, Fire Station Buildings, High St.

Greenwich B.C. Erection of 101 dwellings in Pond Rd., Blackheath. Borough Engineer and Surveyor, Town Hall, S.E.10.

Hackney. Scheme proposed for erection of 310 maisonettes, 39 flats and 30 houses on Bentham Rd. site.

Harold Hill (Essex). Primary school costing £89,212 to be built on Harold Hill estate No. 4.

Hornchurch. Approval granted for erection of Dunningford primary school. Cost estimated at £84,050.

Ilford. Plans in hand for factory in Cranley Rd. for Suburban Developments (Ilford), Ltd.

Ipswich T.C. Erection of 16 houses and five blocks of flats on three sites. Borough Engineer and Surveyor, 19 Tower St.

Leicester. Plans in hand for £135,000 Eyres Monsell estate.

Letchworth U.D.C. Erection of 54 houses on Grange estate. H. Plinston, clerk, The Council House, Broadway.

Lockerbie. T. Morton and Son, 41 Bank St., Dumfries, are architects for factory proposed by Northern Wholesale Dairies, Ltd.

London. It is hoped to include extensions to Wandsworth Technical College, Woolwich Polytechnic and Westminster College and adaptation of Cordwainers Technical College, in 1954-55 building programme.

Maidstone T.C. Complete rewiring and installation of fluorescent light fittings in Corn Exchange is being considered.

Mirfield (Yorks) U.D.C. Approval given to erection of 34 bungalows on Kitson Hill estate and 18 houses on Coppin Hall Lane site.

Newcastle-on-Tyne. Layout plans approved for erection of 1937 houses at Kenton and 604 at Fawdon. Five-year plan includes libraries at Kenton, Benton Hall, Jesmond, and Denton.

Newry (Down) U.D.C. Construction of 36 dwellings on Armagh Rd. estate. G. Cronin, town clerk, Council Offices, Town Hall.

Portsmouth. Demidecki and Son propose to build factory on Fratton Industrial Estate.

Richmond (Surrey). It is proposed to erect £134,223 Ham secondary school.

Romford. Erection of Cross Rd. infants' school at cost of £50,980 has been approved.

St. Albans. Construction of 6 shops and 12 flats on St. Julian's site, and 10 shops and 20 flats on New Greens site. Also 50 houses and flats on Marshalswick Lane estate. City Engineer and Surveyor, 16 St. Peter's St.

St. Helens. Layout plan approved for 520 dwellings on Broad Oak site at Derbyshire Hill.

Stepney B.C. Scheme being planned for Locksley St. site which will involve some 260 flats, 104 maisonnettes, 32 houses, etc.

Tottenham B.C. Erection of 30 flats in High Rd. Borough Engineer, Town Hall, N.15.

Wakefield. Three-storey and six-storey blocks of flats (58 in all) proposed in George St.

Walsall T.C. It is proposed to build about 1,660 houses, 14 shops and other buildings on Mossley estate.

Watford R.D.C. Construction of 90 dwellings at Cecil Lodge, Abbots Langley. Council's Architects, Dawe, Carter and Partners, 33 Clarendon Rd.

Wellington (Salop) R.D.C. Erection of 229 houses at Hadley. J. E. Morris, clerk, Council Chambers, Tan Bank.

Weymouth T.C. Erection of 24 flats and 14 bungalows on Downclose estate. Borough Engineer and Surveyor, 6 Pulteney Buildings.

Woolwich B.C. Scheme proposed for erection of 105 houses, 70 flats and other buildings on Blithedale Rd. site.

Worcester. Construction of three-storey block of shops and maisonnettes on Newtown No. 2 estate. City Engineer and Surveyor, 22 Bridge Street.

TRADE NOTES

New Branch.—Falk, Stadelmann and Co., Ltd., have moved their branch in Nottingham to larger premises at 1 Kayes Walk, off Stoney Street.

Greek Duties.—Under revised Greek customs duties, the turnover tax on imported goods will be calculated according to the new drachma parity, and reduced to 15% *ad valorem*, (instead of 40-150% hitherto), except for special items such as radios, refrigerators and electric stoves on which the tax will be 30%.

The Government sponsored factory at Wythenshawe, of Ferranti Ltd., is now expected to begin production of electronic equipment, etc., in August. Full production may possibly be reached at the end of the year.

Changes of Address.—The Association of Steel Conduit Manufacturers have this week moved to 96 Hagley Rd., Edgbaston, Birmingham 16. Telephone: Edgbaston 4148/9 and 4140.

The offices and works of the Warm-Glow Co., Ltd., are now at Progress Rd., Leigh-on-Sea, Essex. Telephone: Eastwood 55742.

Area Office.—Barlow-Whitney Ltd., have terminated their agency arrangement with Turner, Richardson and Co. Ltd., of Manchester, and have opened their own Northern Counties office at 32 Deansgate, Manchester 3 (telephone: Blackfriars 3851), under Mr. J. T. Sharples, B.SC.(TECH.), A.M.I.E.E. district engineer and manager.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Dowler Electric Motor Repair Co., Ltd., 28 Danbury St., N.1. To take over business of electrical repairers carried on as "Radelec" by Cyril Dowler and Roy L. Dorler at Danbury St., Islington. Cap.: £1,500. Perm. dirs.: H. A. Hull, R. C. Hill, and C. Dowler.

Inferation Ltd., 11, Old Bond St., W.1. Electricians, electrical and radio engineers, etc. Cap.: £100. Dirs. to be appointed by subs. Subs.: W. E. Baldwin and Violet H. Baldwin, 15 Elsworthy Rd., N.W.3.

A. E. Horder and Co., Ltd., 515 Fishponds Rd., Bristol. Electrical engineers and general electrical installation contractors, etc. Cap.: £1,000. Dirs.: W. T. Townsend (perm. man. dir.) and Mrs. E. M. Townsend.

W. F. Martin and Co., Ltd. Manufacturers of and dealers in domestic glass, lighting glass, chandeliers, laboratory technical glass, glass and other imitation jewellery, drawn glass, etc. Cap.: £1,000. Dirs.: to be appointed by subs. Subs.: W. F. Martin, 29 Henshaw St., S.E.17.

L. L. Samson, Ltd., 5 Thornhill Rd., West Croydon, Surrey. Electrical and mechanical engineers, etc. Cap.: £1,000. Dirs. L. L. Samson and Elizabeth Samson.

E. H. Billing and Co., Ltd., 174 Braunstone Lane, Leicester. Mechanical and electrical engineers, etc. Cap.: £3,500. Perm. dirs.: E. H. Billing and Mrs. E. M. Billing.

Willow Bridge Instruments, Ltd. Electrical, gas, marine, hydraulic, aeronautical, pneumatic, ventilating, heating, chemical and general engineers, jig and tool makers, etc. Cap.: £100. Dirs.: P. J. Levy, 1 Kathleen Ave., Acton, W.3, and A. E. Proctor, 2 Craigmuir Park, Wembley, Middx.

W. J. Smith (Auto-Electrical) Ltd., 546 Oldham Rd., Miles Platting, Manchester, 10. Electrical storage battery manufacturers, etc. Cap.: £1,000. Dirs.: W. J. Smith and W. F. B. Sutcliffe.

Puro Fires Ltd., 9 Sydenham Rd., Guildford, Surrey. Electrical equipment specialists, etc. Cap.: £5,000. Dirs.: R. S. Prendergast and A. Watt.

Chas. Richardson & Sons Ltd., Green Lane, Romiley, Cheshire. To take over business carried on as "Charles Richardson and Sons" at Romiley, electrical and mechanical engineers and contractors, etc. Cap.: £15,000. Dirs.: W. Richardson, R. A. Ward, D. P. Ward, J. R. Worsley and J. Eaves.

Richard-Edwards Engineering Co., Ltd., 156 Acre Lane, Brixton, S.W. Electrical, radio, radar, television and optical engineers, etc. Cap.: £100. Dirs.: D. E. Urry and W. R. Walls.

Roberts (Pollard's Hill) Ltd., 10 South Lodge Av., Pollard's Hill, Mitcham, Surrey. Domestic stores, and general and electrical engineers, etc. Cap.: £2,500. Dirs.: V. N. Spurge and S. G. Watson.

Rymer Repair Service Ltd. 3 Oxford St., W.1. Repairers and renovators of articles of all kinds, including electrical, wireless and television goods, furniture, etc. Cap.: £100. Dirs.: H. J. Meyer and P. B. Ryan.

E. Shipton and Co., (Engineering) Ltd. Ferndown, Northwood Hills, Middlesex. Electrical and mechanical engineers, etc. Cap.: £100. Dirs.: E. Shipton and Rebecca Shipton, and B. Strong.

Smith and Cookson (Domestic) Ltd., 106/108 Whitechapel, Liverpool, 1. Selling agents for Smith and Cookson Ltd., merchants, importers and exporters of and dealers in electrical, wireless and television goods, etc. Cap.: £100. Dir.: H. Cookson.

Smith and Cookson (Electrical) Ltd., 106/108 Whitechapel, Liverpool, 1. Selling agents for Smith and Cookson Ltd., merchants, importers and exporters of and dealers in electrical, wireless and television goods, etc. Cap.: £100. Dir.: T. Armstrong.

Smith and Cookson (Radio) Ltd., 106/108 Whitechapel, Liverpool, 1. Selling agents for Smith and Cookson Ltd., merchants, importers and exporters of and dealers in electrical, wireless and television goods, etc. Cap.: £100. Dir.: H. A. Smith.

MEETINGS TO NOTE

THURSDAY, MAY 7

BRITISH INSTN. OF RADIO ENGRS. (Merseyside Section).—Annual meeting. "Radio and Electronics Industry in India." C. D. Clifford. Elect. Showrooms, Whitechapel, Liverpool, 6.45 p.m.

I.E.E. (London Utilisation Section).—"Research in Electrical Manufacturing Industry." L. J. Davies. Savoy Place, W.C.2, 5.30 p.m.

FRIDAY, MAY 8

A.S.E.E. (Crewe Branch).—"High Voltage Switchgear and Protection." Mr. Fawthrop. Royal Hotel, 7.30 p.m.

INST. OF X-RAY TECHNOLOGY.—"Is Super-Voltage for Therapy Really Necessary?" G. S. Innes I.E.E., Savoy Place, W.C.2, 7.p.m.

MONDAY, MAY 11

A.S.E.E. (Central London).—"Development of Clocks." G. W. Levey. St. Ermin's Hotel, Caxton St., S.W.1, 6.45 p.m.

TUESDAY, MAY 12

I.E.S. (Liverpool Centre).—Annual meeting. "Electrical Equipment of Mersey Tunnel." C. C. Smith. Elect. Showrooms, Whitechapel, 6 p.m.

I.E.S. (London).—Annual meeting. "Lighting in Australia and Europe," by D. C. B. Maclurcan. Royal Society of Arts, John Adam St., W.C.2, 6.p.m.

WEDNESDAY, MAY 13

A.S.E.E. (Bradford).—"Air-Conditioning." J. Rose. Midland Hotel, 7.30 p.m.

ROYAL SOC. OF ARTS.—Trueman Wood lecture on "Training for Science and Technology." Sir Richard Southwell, 2.30 p.m.

THURSDAY, MAY 14

INCORP. PLANT ENGRS. (Newcastle-on-Tyne).—"Electrical Fuel Injection Equipment." H. J. Stoneman. Roadway House, Oxford St., 7.30 p.m.

I.E.E. (London).—Annual meeting. (Corp. members and assoc. only). Savoy Place, W.C.2, 5.30 p.m.

EXHIBITION DIARY

B.I.F. at Earls Court, Olympia and Castle Bromwich, closes tomorrow Friday May 8.

Royal Ulster Agricultural Show. Opens at Balmoral Showgrounds, Belfast, on May 27 and closes on May 30.

Bath and West Agric. Show to be held between June 3 and 6.

British Plastics. Opens at Olympia on June 3, continuing until June 13.

Three Counties Agric. Show will take place on The Racecourse, Hereford, between June 9 and 11.

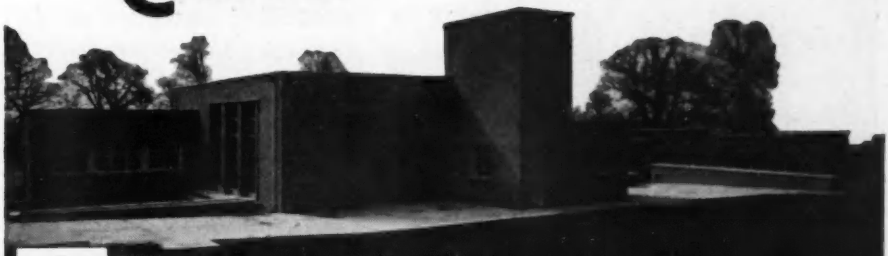
Another fine new school — wired throughout with

HENLEY CABLE

Milford Infant Primary School, Yeovil (Somerset County Council)

County Architect: R. O. Harris, F.R.I.B.A

Electrical Contractor: **H. J. MORLEY** Waterloo Lane, Yeovil



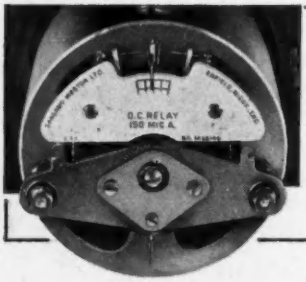
Let Henley Cables carry the current

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

Weston

MOVING COIL RELAYS

This modern range of relays is ideal for all Laboratory or Industrial Purposes. Built on the permanent-magnet moving coil principle, unaffected by external magnetic fields, the precious metal contacts will not oxidise or tarnish, and the high torque developed ensures positive contact pressure. Supplied in Bakelite casing. Most applications call for special requirements and enquiries should, therefore, enclose a diagram of the circuit to be closed and state (a) High and/or low contact adjustment; (b) mounting position; (c) resistance; (d) values of current and voltage in local circuit and whether D.C. or A.C.; (e) values of resistance and any inductance or capacitance in local circuit; and (f) any special accuracy required. Every 'Weston' relay is specially designed to give the best possible performance for its individual purpose. (The Model illustrated is S54).



ACCURACY OF ADJUSTMENT. Special note should be made of the reduction gearing which enables the user to make accurate adjustment with absolute ease. The accuracy and rigidity of the mounting ensures constant centring after adjustment. Yet another special 'Weston' feature.

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1212 (4 lines). Grams: Sanwest, Enfield

Branches:

London, Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF BELFAST

Electricity Department

CABLE WORKS

TENDERS are invited for the supply, delivery, laying, erection and maintenance of:—

(a) 110 kV and 33 kV main cables, auxiliary cables and accessories for Belfast Municipal Electric Power Station West (formerly Victoria Power Station) to Donegall Substation interconnector (Form of Tender No. W.1235).

(b) 33 kV main cables, auxiliary cables and accessories for Stage No. II of the 33 kV distribution system (Form of Tender No. N.1236).

Forms of Tender, conditions, specifications and drawings, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas in respect of each item which will be refunded provided bona fide tenders are lodged and not withdrawn. Extra copies of the contract documents may be obtained at one guinea per set; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for ——, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, June 19, 1953.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
May 1, 1953. (D 617)

COUNTY BOROUGH OF GATESHEAD

DRYDEN ROAD GRAMMAR SCHOOL FOR 720 GIRLS

APPLICATIONS are invited from Contractors desirous of tendering for the ELECTRICAL INSTALLATION at the above, in accordance with the scheme and specification prepared by the consultants, Messrs. R. W. Gregory and Partners, Newcastle-upon-Tyne.

Intending contractors should give evidence of having carried out contracts of similar size.

Copies of drawings, specifications and form of tender may be obtained from, and the general conditions of contract inspected at the Borough Surveyor's office, on deposit of £2 2s. which will be refunded on receipt of a bona fide tender or the return of the drawings and specification.

The contract for the above work will form a subcontract to the main building contract, and the subcontractor will be required to enter into a bond with the general contractor and the corporation.

Applications to tender should be made to A. J. McGregor, Borough Surveyor, Municipal Buildings, Swinburne Street, Gateshead, 8, by Monday, May 18, 1953, and tenders returned to the undersigned on the official form, in the endorsed envelope supplied, by noon on Wednesday, June 10, 1953.

The lowest or any tender will not necessarily be accepted.

J. W. PORTER,
Town Clerk.

Town Hall,
Gateshead, 8.
May 1, 1953 (D 616)

BOROUGH OF SOUTHGATE

IMPROVEMENT OF STREET LIGHTING ON MAIN ROADS

TENDERS are invited for the following contracts in connection with the improvement of street lighting to Group A standard on certain main roads within the Borough:—

Contract A. Supply only of LANTERNS and CONTROL GEAR for: (i) 134 No. 140 W sodium vapour discharge lamps.

(ii) 35 No. 250 W mercury vapour discharge lamps.

Contract B. Supply and erection of 168 No. concrete LAMP STANDARDS and fixing 169 No. LANTERNS, CONTROL GEAR, WIRING, etc.

Separate contract documents will be issued, and contractors may tender for one or both contracts.

Contractors wishing to tender should apply to the Borough Engineer and Surveyor for a copy of the relevant documents.

Sealed tenders, in the envelopes provided, must be received by the undersigned not later than 9 a.m. on Monday, May 18, 1953.

The Council do not bind themselves to accept the lowest or any tender.

GORDON H. TAYLOR,
Town Clerk.

Town Hall, Palmers Green,
London, N.13. (D 553)

BUSHEY URBAN DISTRICT COUNCIL

IMPROVED LIGHTING SCHEME

London Road, High Street, Clay Hill, and Sparrows Herne (A.411 and High Road A.4140)

TENDERS are invited for the following:—

(a) Supply of 80 No. 140-W sodium vapour discharge lanterns, complete with lamps and all ancillary electrical equipment as detailed; and

(b) Supply of 80 No. reinforced concrete lighting columns (mounting height 25 ft) together with appropriate brackets as detailed.

Form of Tender, specification and bills of quantities may be obtained, on payment of a deposit of two guineas for each part as above, from the Engineer and Surveyor, Council Offices, Rudolph Road, Bushey, Herts. Cheques are to be made payable to "Bushey Urban District Council," and upon receipt of a bona fide tender and the return of all documents the deposit will be refunded.

Tenders must be delivered not later than 10 a.m. on Monday, June 1, 1953, in the envelope provided, endorsed "Improved Lighting Scheme—London Road."

The Council do not bind themselves to accept the lowest or any tender, and the acceptance of a tender will be subject to the approval of the Ministry of Transport.

C. G. EVERATT,
Clerk of the Council.

Council Offices,
Rudolph Road, Bushey, Herts.
May 1, 1953. (D 618)

BOROUGH OF MORLEY

STREET LIGHTING, A.650

TENDERS are invited for the supply and installation of a sodium lighting scheme on Trunk Road A.650. Specifications and forms of tender, upon payment of a deposit of 10s. 6d., which will be refunded after the receipt of bona fide tenders, will be supplied by the Street Lighting Superintendent, Town Hall, Morley, to whom completed forms should be returned not later than June 8, 1953.

E. V. FINNIGAN,
Town Clerk.

Town Hall, Morley, Yorks. (D 623)

THE STATE ELECTRICITY COMMISSION OF QUEENSLAND

Specification T.F./16

THE SUPPLY OF MATERIALS, CLEARING OF ROUTE AND ERECTION OF 132,000 V OVERHEAD TRANSMISSION LINE

THE COMMISSION invite tenders for the above work, which are returnable at their office in Eagle Street, Brisbane, Queensland, on August 19, 1953.

Copy of Specification T.F./16 may be seen at the office of the Agent-General for Queensland, 409-410 Strand, London W.C.2. (D 599)

CITY OF MANCHESTER

THE EDUCATION COMMITTEE invite tenders for ALTERATIONS AND ADDITIONS to ELECTRICAL INSTALLATION at NEWTON HEATH TECHNICAL COLLEGE, MANCHESTER. Specification and drawings may be obtained from the City Architect, Town Hall. Deposit £1 1s. (returnable). Tenders, sealed in endorsed envelopes, must be delivered before 10 a.m., June 3, 1953.

PHILIP B. DINGLE,
Town Clerk.

May, 1953. (D 619)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 86/53. MAINTENANCE ENGINEER (MECHANICAL), Bolton Generating Station. Salary, £787-£818 (G.6).

Vacancy No. 87/53. ASSISTANT SHIFT CHARGE ENGINEER, Agecroft H.P. Generating Station, near Manchester. Salary, £641-£667 (G.9).

Vacancy No. 91/53. STATION SHIFT CONTROL ENGINEER, Chadderton L.P. Generating Station, near Oldham. Salary £556-£569 (E.10).

Apply, quoting Vacancy No., to Establishments Officer, British Electricity House, 625 Wilmslow Road, Manchester 20, before May 16. (D 576)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments at Norfolk Sub-Area Headquarters, Norwich:—

(a) THIRD ASSISTANT ENGINEER
(Planning and Development) 29/53.R

The successful candidate will be responsible to the Planning and Development Engineer for the preparation of schemes and development in an area which consists of mixed urban and rural networks at voltages up to and including 33 kV. Preference will be given to candidates who have had experience in the preparation of specifications relating to overhead lines and substations.

(b) SECOND ASSISTANT ENGINEER
(Operation and Maintenance) 30/53.R

Candidates should have had a wide experience in the operation and maintenance of urban and rural distribution systems at voltages up to 33 kV, including fault location, commissioning, testing and general supervision of protective gear, and the carrying out of pressure and other special tests. Experience on systems protected by arc suppression coils, and a knowledge of radio and telephone equipment, would be an advantage. Corporate membership of the Institution of Electrical Engineers or the possession of a degree in electrical engineering will be an advantage.

The salary for both appointments will be in accordance with the National Joint Board Salary Agreement as follows:—

(a) Class "H," Grade 10, commencing at £641.
(b) Class "H," Grade 7, commencing at £772.

Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme, and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary should be submitted to The Manager, Norfolk Sub-Area, Eastern Electricity Board, 4 Duke Street, Norwich, Norfolk within fourteen days of the appearance of this advertisement. (D 601)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointments in the Transmission Department at Divisional Headquarters:—

(a) GENERAL ASSISTANT ENGINEER (ELECTRICAL)

Salary, Class "AX/CX," Grade 8, £526-£708 per annum.

Duties include assisting in the construction and maintenance of grid lines, cables and substations, and provide a suitable basis for promotion to a higher technical grade.

(b) SURVEYOR (TEMPORARY)

Salary, Grade 5, Schedule "D," £595-£704 per annum.

Duties include levelling, setting out, preparing profiles and plans for overhead lines and substations.

Experience in the use of a theodolite is essential and a knowledge of the interpretation of aerial survey data an advantage.

The commencing salaries (which include London weighting) will depend upon experience and qualifications but will be within the above ranges.

Forms of application may be obtained from the Authority's Headquarters or from any Divisional Office of the Authority, and should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by May 31, 1953.

W. N. C. CLINCH,
Controller.
(D 580)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of SUB-AREA COMMERCIAL OFFICER in the Dumfries and Galloway Sub-Area. The salary for the appointment will be £1,025 per annum and future salary and conditions of service will be in accordance with agreements made by the National Joint Managerial and Higher Executive Grades Committee.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess an equivalent qualification, and be experienced in all aspects of commercial activities in a Sub-Area. The candidate appointed will be required to deal with the organisation of all commercial activities in the Sub-Area and will be responsible for promoting the sale and utilisation of electricity, the operation of service centres, service to consumers, and should have a knowledge of installation work. Experience in a large rural area will be an advantage.

The appointment is superannuable and the successful applicant may be subject to medical examination. Forms of application, which may be obtained from the applicant's appropriate officer or the undersigned, should be completed and returned to the undersigned not later than May 23, 1953.

J. MEEK,
Secretary.

62 Dalziel Drive, Glasgow S.1.
April 29, 1953. (D 609)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement, Schedule "A" or "D."

JUNIOR ENGINEER (SHIFT) (CONTROL ROOM)
Barking Generating Station

Qualifications: sound engineering training with subsequent experience in generating station with, preferably, Ordinary or Higher National Certificates in Electrical Engineering. Salary: Class "M," Grade 17 (£557/11/- per annum).

JUNIOR ENGINEER (ELECTRICAL TEST)
Fulham Generating Station

Candidates should have had engineering training with technical qualifications to at least Ordinary National Certificate in Electrical Engineering, followed by experience in some branch of electrical test work. Salary: Class "L," Grade 20 (£415 per annum).

JUNIOR ENGINEER (CONTROL ROOM)
Fulham Generating Station

Candidates should have had engineering training with technical qualifications to at least Ordinary National Certificate standard in Electrical or Mechanical Engineering. Salary: Class "L," Grade 20 (£415 per annum).

ENGINEERING DRAUGHTSMAN
Transmission Department, Divisional H.Q.

Candidates should have received good general education and general drawing office experience covering preparation of cable route records; be experienced in surveying of cable routes; and have received training in preparation of substation layouts and site surveying. Salary: Grade 6 (£458-£595/7/- per annum).

Applications may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (D 606)

GOVERNMENT OF MALTA

Jesuits Hill Power Station and Distribution System

RESIDENT ENGINEER

APPLICATIONS are invited for the temporary post of Resident Engineer for the Malta Electricity Supply Scheme. The initial installation consists of three 5,000 kW turbo-alternators, with three 70,000 lb/hr oil-fired boilers and ancillary equipment. The distribution system consists of a 11 kV ring main system with underground cables, overhead lines, and indoor and outdoor sub-stations, and low-voltage distribution, and the adoption of the existing single-phase lines into the new system.

Candidates should be corporate members of one of the senior engineering institutions or possess equivalent qualifications, and have had sound training in electrical and mechanical engineering, with subsequent practical experience in the installation and operation of steam-turbine generating plant, water-tube boilers, and ancillary plant, and 11 kV and L.V. cables, overhead lines and substations equipment.

The appointment is temporary for a period of two years on an inclusive salary of £1,800 per annum. Free passages are provided at the commencement and completion of the contract. Vacation leave at the rate of two and a half days per completed month of residential service.

Applications, endorsed "Residential Engineer, Malta," stating age, qualifications and experience, should be forwarded immediately to the undersigned, who will communicate with candidates selected for further consideration.

PRICE, CARDEW & RIDER.

8 and 10 Queen Anne's Gate,
London, S.W.1. (D 581)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

APPOINTMENT OF DISTRICT ENGINEER

APPLICATIONS are invited for the position of District Engineer in the Kilmarnock District of the above sub-area.

Applicants should have received a sound technical and practical training, and have long and comprehensive experience, including planning, construction, operation and maintenance of overhead and underground networks and sub-stations up to and including 33 kV.

Preference will be given to applicants who are corporate members of the Institution of Electrical Engineers or hold equivalent qualifications.

Salary in accordance with the National Joint Board Agreement, Class "Z," Grade 2, £941 to £962 per annum, and the position superannuable in accordance with the B.E.A. and Area Boards' Scheme.

A house can be made available to the successful candidate if married.

Forms of application may be obtained from the undersigned or any other sub-area manager, and should be returned to me duly completed with any additional information not later than May 22, 1953.

A. E. ROOTS,
Manager.

Greenholm Street, Kilmarnock.
April 30, 1953. (D 578)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(a) SHIFT CHARGE ENGINEER, Castle Meads Generating Station, Gloucester. N.J.B. "E.7," £649 to £681.

(b) SECOND ASSISTANT STATION CHEMIST, Feeder Road/Bath Generating Stations (based at Feeder Road, Bristol). N.J.B. "F.11," £548 to £565.

(c) GENERAL ASSISTANT ENGINEER, Technical Dept., Plymouth. N.J.B. "8 AX/CX," £501 to £675.

(d) JUNIOR ENGINEER, Technical Dept., Plymouth. N.J.B. "9 AX/CX," £390 to £556.

Superannuation scheme.

Candidates for (a) should have had considerable experience in a modern generating station. Graduate or corporate membership of a recognised engineering institution or equivalent desirable.

For (b) should have had practical experience in the analysis of coal, water, oil, etc., for generating stations. Preference given to candidates possessing H.N.C. in Chemistry or equivalent. Successful applicant will be required to carry out routine chemistry duties, mainly of an analytical nature, under the supervision of a group chemist.

For (c) should possess technical qualifications leading to A.M.I.E.E. and have served in the works of one of the leading electrical manufacturers. Experience in high-voltage insulation testing considered an advantage.

For (d) should have served either with one of the leading electrical manufacturers or completed a B.E.A. graduate training course.

Application forms AE6, obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned by May 18, 1953. (D 567)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, an ASSISTANT ENGINEER (Overhead Mains) in District 347 (Cardiff) in the Central Sub-Area of the Board.

Salary in accordance with Class "G," Grade 10 (£908/£619/£630) of N.J.B. schedule.

Applications, stating age, present position and salary, qualifications and experience and giving three referees, to be addressed to the Secretary to arrive by May 16, 1953.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (D 605)

BRITISH ELECTRICITY AUTHORITY

North Western Division

DRAUGHTSMEN (MECHANICAL) and DRAUGHTSMEN (ELECTRICAL) required at Generation Construction Drawing Office, Agecroft, near Manchester. Applicants should have had experience of (a) the layout of generating stations or general mechanical engineering, or (b) cable layouts and electrical diagrams. Salary, depending on qualifications and experience, in range £433-£567, or £567-£671 (N.J.B. Schedule "D," Grade 6 or 5).

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before May 14. Quote Vacancy No. 89/90/53. (D 575)

MIDLANDS ELECTRICITY BOARD

BIRMINGHAM and District Sub-Area require a SECOND ASSISTANT ENGINEER to take charge, under a Senior Assistant Engineer, of the Transmission Section. Wide experience required in the installation, operation and maintenance of switchgear, transformers, cables and protective equipment on circuits up to and including 33 kV, and of an extensive tele-communication system. Appropriate technical qualifications necessary. Salary £1,032/£1,068 (N.J.B. Grade N.7) superannuable.

Apply within 14 days, stating age, experience, salary and position to Emil Brnathen, Manager, Midlands Electricity Board, Birmingham and District Sub-Area, 14 Dale End, Birmingham, 4.

A. STEPHENS,
Secretary.
(D 602)

SOUTHERN ELECTRICITY BOARD

SENIOR ASSISTANT COMMERCIAL ENGINEER
(Sales and Contracting)

NO. 3 (PORTSMOUTH) SUB-AREA. Salary N.J.B., Class "J," Grade 4 (£1,026-£1,071 per annum). N.J.B. conditions of service.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or have a similar qualification. The duties of the position require a sound knowledge and experience of all aspects of service to domestic, commercial and industrial consumers, active sales promotion in domestic, commercial and rural load development with a wide experience of all phases of electrical contracting work.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than May 22, 1953.

ASSISTANT ENGINEER (MAINTENANCE)

Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B., Class "G," Grade 9 (£641-£667 per annum). N.J.B. conditions of service.

The duties of the post will be to assist generally with the operation and maintenance of the H.V. and L.V. overhead and underground distribution systems working at voltages up to 33,000, with particular attention to the testing and commissioning of new work and to special testing, including fault location. Standby duties are involved. The qualifications will include technical training to the standard of the I.E.E. Associate Membership Examination and experience of similar work.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, Berks, and returned to him, in envelopes suitably endorsed, not later than May 18, 1953.

ASSISTANT ENGINEER (TECHNICAL)

Oxford District of No. 2 (Newbury) Sub-Area. N.J.B. Class "G," Grade 11 (£573-£596 per annum). N.J.B. conditions of service.

The duties of the post will be principally to assist in the planning of substations and H.V. and L.V. overhead and underground networks, and to undertake maintenance work when required. The qualifications will include a suitable technical training and general experience of distribution work.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, Berks, and returned to him, in envelopes suitably endorsed, not later than May 18, 1953.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' Superannuation scheme, if eligible. (D 603)

NORTH WESTERN ELECTRICITY BOARD

PURCHASING OFFICER

Chief Engineer's Department, Area Board Headquarters

APPLICATIONS are invited preferably from corporate members of the Institution of Electrical Engineers, who have had considerable experience in the Electricity supply industry and who are familiar with distribution plant and equipment, for the appointment of Purchasing Officer at Area Board Headquarters.

The duties of the post are:—

To issue specifications and receive tenders and to advise thereon.

To issue orders for plant and supplies purchased centrally.

To progress work through factories and co-ordinate inspection and delivery.

To negotiate contract price adjustments.

To co-ordinate stock control on certain items throughout the area.

The provisional salary will be within the range £1,475-£1,750 per annum. This is subject to negotiation.

Applications, stating age, qualifications and experience, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, not later than Saturday, May 16, 1953. (D 579)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

APPOINTMENT OF THIRD ASSISTANT ENGINEER

Technical Department

(Protective Gear and Electrical Plant Testing)

APPLICATIONS are invited for the above-mentioned appointment with headquarters at Darlington.

Applicants should possess qualifications of at least Graduate I.E.E. standard and have had experience in the commissioning and maintenance of protective gear and the testing of large electrical plant.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule "C," Grade 5 (£649-£835 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne 1, to whom they should be returned to arrive not later than May 23, 1953. (D 577)

MIDLANDS ELECTRICITY BOARD

DEMONSTRATORS (Female) required for the Shrewsbury and Ludlow districts. Applicants must have had a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. certificate.

Duties involve lecture demonstrations in service centres and on consumers' premises, and advice to consumers on the selection and use of electrical apparatus. Salary £380-£470 per annum (N.J.C. Grade 1). Superannuable.

Applications in writing, within 14 days, stating age, education, qualifications, training and experience, to Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.
(D 582)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

DEPUTY POWER STATION SUPERINTENDENT, Kingston "A" and "B" Power Stations. Preference will be given to applicants who possess B.Sc. degree or equivalent qualifications, or are corporate members of the Institution of Mechanical and/or Electrical Engineers. Experience in the operation and maintenance of modern high-pressure turbine and boiler plant and E.H.T. switchgear, and the administration of a large power station with the control of labour is essential. N.J.B. conditions of service and salary Class "G," Grade 3, £1,019 11s. p.a. including London allowance.—Applications, giving details of education, present position, experience, etc., should be sent to the Power Station Superintendent at Kingston Power Station, Downhall Road, Kingston-upon-Thames, to arrive by May 18, 1953. (D 583)

NORTH EASTERN ELECTRICITY BOARD

Harrogate Sub-Area

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER in Commercial Officer's Department, Sub-Area Headquarters. Salary, Schedule "A," Class "G," Grade 13, £496-£514. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne, 1, within ten days of the appearance of this advertisement. (D 574)

BOROUGH OF ILFORD

ELECTRICAL ENGINEERING ASSISTANT (A.P.T. V)

APPLICATIONS are invited for the above-mentioned appointment on the permanent staff of the Borough Engineer's Department at a salary in accordance with A.P.T. Grade V (£595 to £645), plus London Weighting.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, and have served an indentured apprenticeship in electrical engineering with a reputable firm, be capable draughtsmen with good experience in the preparation of schemes, specifications and estimates for all classes of electrical installation work. Duties will include the preparation of drawings, inspection of premises, supervision of installations and general routine work in the Electrical Section.

The appointment will be whole time (private practice being prohibited), superannuable, subject to one month's notice on either side, to the National Scheme of Conditions of Service, and to medical examination.

Applications on forms obtainable from the Town Clerk, Town Hall, Ilford, Essex, should be submitted not later than May 18, 1953. (D 506)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL INSPECTOR (TEMPORARY) required for the Gold Coast Railway Department for one tour of 18-24 months in the first instance. Salary according to age and war service in the scale £990, rising to £1,230, a year. Outfit allowance, £60. Gratuity at the rate of £100 or £150 a year. Free passages. Liberal leave on full salary. Candidates must possess a National Certificate in Electrical Engineering or its equivalent, and have had a sound training and considerable practical experience in the maintenance of low tension a.c. and d.c. distribution cables and associated switchgear, and of motors and controllers of up to 100 h.p. as installed in heavy engineering workshops. Knowledge of electric wharf and overhead cranes an advantage.

Apply, in writing, to the Crown Agents, 4 Millbank, London S.W.1, stating age, name in block letters, full qualifications and experience, and quoting M2C/33468/EE. (D 608)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL OFFICER required in the No. 2 Sub-Area (Runcorn District).

Salary £831 to £867 per annum (N.J.B. Class "G", Grade 5).

Applicants must be corporate members of the Institution of Electrical Engineers and have had considerable experience on the commercial side of the electricity supply industry including the supervision of contracting work.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 2 Sub Area, Electricity House, Sandiway, nr. Northwich, Cheshire, quoting reference 138A. Closing date May 19, 1953. (D 566)

CROWN AGENTS FOR THE COLONIES

METER SUPERINTENDENT required for the Gold Coast Electricity Department for two tours of 18 to 24 months in the first instance. Commencing salary according to age and experience, in scale £990 rising to £1,230 a year. Gratuity up to £150 a year. Free passages. Liberal leave on full salary. Outfit allowance £60. Candidates should be educated up to National Certificate standard and have served an apprenticeship with subsequent experience in the testing and calibrating of single and polyphase meters and in the installation and testing of e.h.t. switchboard instruments and their associated transformers, and have a good knowledge of protective gear.

Apply in writing to the Crown Agents, 4 Millbank, London, S.W.1, stating age, name in block letters, full qualifications and experience and quoting M2C/29649/EE. (D 565)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 33/53.

APPLICATIONS invited for superannuable N.J.B. appointment of THIRD ASSISTANT ENGINEER (Progress) in the Generation (Construction) Dept. of this H.Q. Salary, AX/CX.5 (£649-£835 p.a.).

To carry out correspondence connected with deliveries of materials and co-ordination of progress work generally; reports and progress charts; attendance at site progress meetings.

Application forms, obtainable from Divisional Secretary, British Electricity Authority, South Wales Division, Twyn-y-Fedwen Road, Gabalfa, Cardiff, should be returned by May 20, 1953.

April 29, 1953. (D 573)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

CIVIL ENGINEERING DRAUGHTSMAN
Construction Department, North Wilford
(Vacancy No. 22/53)

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with offices and administrative buildings.

The salary will be in accordance with Grade 5 (£567-£671 per annum) or Grade 6 (£433-£567 per annum) of Schedule "D" of the National Joint Board Agreement.

DRAUGHTSMAN
Transmission Department, Divisional Headquarters, Nottingham (Vacancy No. 42/53)

Candidates should preferably have had experience in one or more of the following: design and construction of high voltage sub-stations or overhead transmission lines and underground cable systems, civil engineering, electrical engineering, including layouts and diagrams for h.v. transformers and switchgear.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 6 of Schedule "D" (£433-£567 per annum) according to qualifications and experience.

Closing date for this appointment will be May 14, 1953

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department, North Wilford
(Vacancy No. 44/53)

Senior Draughtsmen are required in the mechanica section of the Construction Department at North Wilford Power Station, Nottingham. Candidates should have experience in one or more of the following:—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework; condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 5 (£567-£671 per annum) and Grade 6 (£433-£567 per annum) of Schedule "D" according to experience.

Closing date for this appointment will be May 14, 1953.

MAINTENANCE ENGINEER (ELECTRICAL)
Freemen's Meadow Power Station, Leicester
(Vacancy No. 50/53)

Applicants should have a sound knowledge of modern power station equipment including air-blast switchgear, large alternators, and P.F. auxiliaries. Corporate membership of the Institution of Electrical Engineers is desirable.

Conditions of service and salary in accordance with the N.J.B. Schedule "A." Class "B," Grade 6 (£833-£866 per annum).

Closing date for the appointment will be May 22, 1953.

JUNIOR ENGINEER
Northampton Power Station (Vacancy No. 54/53)

Candidates should have a sound engineering training with subsequent experience in a modern power station, and preferably have gained an Ordinary or Higher National Certificate in Electrical Engineering.

The salary will be in accordance with Schedule "A," Class "G," Grade 15 (£407 per annum), progressing to Class "G," Grade 14 (£473-£491 per annum).

The closing date for this appointment will be May 22, 1953.

GENERAL ASSISTANT ENGINEER
Coventry Transmission Section (Vacancy No. 51/53)

Applicants should have experience in the operation and maintenance of h.v. transmission lines and sub-stations up to and including 132 kV and should preferably be graduate members of the Institution of Electrical Engineers.

The salary will be in accordance with Class "AX/DX," Grade 8 (£501-£694 per annum) within Schedule "C" of the National Joint Board Agreement.

The closing date for this appointment will be May 18, 1953.

The above appointments will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
(D 600)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, ASSISTANT in Commercial Department of District 101 (Milford Haven) in the Western Sub-Area.

Salary in accordance with Class "C," Grade 10 (£502/£512/£521) of N.J.B. schedule.

Applications, stating age, present position and salary, qualifications and experience and giving three referees to be addressed to the Secretary to arrive by May 16, 1953.

D. G. DODDS,
Secretary.
St. Mellons,
Cardiff. (D 604)

SOUTHERN ELECTRICITY BOARD

DISTRICT MANAGER

APPLICATIONS are invited for the post of Manager of the Lyndhurst District of the No. 4 (Bournemouth) Sub-Area. Provisional salary, £1,335 p.a. Conditions of service and ultimate salary scale will be in accordance with such terms as may be laid down from time to time by the appropriate negotiating body.

Applicants should have a sound commercial and engineering experience gained in the management of electricity undertakings. Experience gained in a rural area would be an additional advantage.

Applications on forms obtainable from me at Head Office or from any Sub-Area Secretary and to be returned to me at Southern Electricity House, Littlewick Green, Maidenhead not later than May 22, 1953.

F. W. KEMPTON,
Secretary.
(D 607)

ASSISTANT ELECTRICAL ENGINEER for large progressive plant. Must have served recognised apprenticeship and hold University degree or equivalent in electrical engineering and be Graduate or Corporate Member I.E.E. Supervisory experience in installation and maintenance all types industrial electrical plant essential. Experience industrial power generation advantage. Age 28-35 years. Pension scheme. Permanent position, good salary.

Applications, in confidence, to Personnel Manager, British Enka Ltd., Aintree, Liverpool 9, giving full particulars of experience and qualifications. (D 610)

ASSISTANT GENERATION ENGINEER wanted by North American company operating in healthy climate in South America, for 30,000 kW steam station now under construction. Applicants should have had at least five years' experience in the operation of plant of 400 p.s.i. or above, be familiar with the "Hagan" control system, feed-water treatment and switchboard operation. Applicants should be 28-35 years of age and preferably married. New house supplied. Liberal salary, first-class passage both ways and home leave with full pay after three years. Reply, giving brief details of age, qualifications and experience. Detailed application form will be forwarded. —Box No. 2635, Electrical Times. (D 588)

ASSISTANT GENERATOR ENGINEER required. S. America. 30,000 kW steam station under construction. Exp. 400 p.s.i. plant Hagan system, water treatment, switchboard op. Age 28/40. Married pref. Good sal., quarters, passage, etc.—Apply Laurie and Co., Employment Specialists, 19 Basinghall Street., London, E.C.2. (D 613)

BRITISH ELECTRICITY AUTHORITY (South East Scotland Division) require immediately a THIRD ASSISTANT ENGINEER (Civil). Applicants should be corporate members of Institution of Civil Engineers or possess equivalent qualifications; have had experience in building specifications, quantities, estimates and design in structural steel and reinforced concrete. Salary, £649-£812 (N.J.B. Class AX/BX/5). Post pensionable.

Application forms, obtainable from Divisional Controller, British Electricity House, Portobello, Midlothian, to be returned by May 29, 1953. (D 594)

ELECTRICAL ENGINEERING DRAUGHTSMAN required by Tees-side firm of engineers for the power and lighting installations of their various contracts. The work will include the preparation of control schemes and wiring diagrams, and contract requisitioning of equipment.—Apply, stating age, experience and qualifications, to Box No. 2639, Electrical Times. (D 592)

ELECTRICITY SUPPLY ENGINEER wanted by North American company operating in South America for position of responsibility. Young single man, experienced in all departments of distribution of electricity (high- and low-tension voltage), familiar with overhead distribution systems, etc. Liberal salary, first-class passage both ways and home leave with full pay after three years. Excellent opportunity for ambitious young man. —Reply, giving brief details of age, qualifications and experience. Detailed application form will be forwarded. Box No. 2633, Electrical Times. (D 587)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICAL DRAUGHTSMEN required for interesting work on high priority aircraft.—Write giving full particulars, including age, salary required, etc. to Personnel Dept., Vickers-Armstrongs Ltd., Hursley Park, nr. Winchester. (D 474)

ESTIMATING ENGINEER required for battery traction sales. Electrical Degree or Higher National Certificate essential. Previous experience in similar job an advantage, but not essential. Age not over 30. Permanent post carrying pension for suitable applicant.—Apply by letter in first instance, outlining experience and salary desired to Commercial Manager, Nife Batteries, Redditch, Worcs. (D 568)

ESTIMATOR required for indoor Sales Staff by Crompton Parkinson, Ltd., Chelmsford. Must have had experience in dealing with inquiries relating to d.c. and a.c. motors, generators and control gear.—Apply to Personnel Officer. (D 516)

EWBANK AND PARTNERS Ltd. have vacancies for the following:—

MECHANICAL ENGINEERING DRAUGHTSMEN experienced in power station design and layout, pipework layout, circulating water systems, and with some knowledge of coal and ash handling plants.

ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in power station and substation distribution systems.

The positions are permanent and are pensionable. Free lunches are provided and a five-day week is in operation. —Applicants should write in the first instance, stating age, details of experience and salary required, to the Secretary, Ewbank and Partners Ltd., Engineering Consultants, 10-11 Grosvenor Place, London S.W.1. (D 591)

FOSTER TRANSFORMERS Ltd., South Wimbledon, S.W.19, require SENIOR DRAUGHTSMEN for work on power transformers ranging from 100 kVA to 3,000 kVA, 66,000 V. Ordinary National Certificate in electrical engineering preferred. Good working conditions. Annual bonus in addition to generally recognised pay rates.—Apply in writing to the Personnel Officer. (D 593)

FUNDAMENTAL ENGINEERING DEVELOPMENTS which will appeal to MECHANICAL and ELECTRICAL ENGINEERS interested in a combination of practical and theoretical work are proceeding at the Stafford works of the English Electric Co. Ltd. The products involved range from heavy power-station equipment to electrical apparatus. Candidates with experience in one or more of the following: aerodynamics, hydraulics, vibration investigation, stress analysis, heat transfer, circuitry problems, are specially invited to apply. Commencing salary £800-£800.—Please write with full details and quoting Ref. 1103A, to Central Personnel Services, English Electric Co. Ltd., 336/7 Strand, London W.C.2. (D 584)

ISLE OF WIGHT. Permanent position to qualified ELECTRICIAN. Full knowledge of T.R.S., lead and conduit installations essential.—Apply, H. Saunders (Electrical Contractors), Ltd., St. James's Street, Newport, I.W. (D 459)

ELECTRICAL RESEARCH AND TESTING ENGINEERS

A. **REYROLLE AND CO.** have a number of vacancies for engineers to be engaged on **electrical research and laboratory testing** in connection with switchgear, protective gear, insulation, etc. For certain of the vacancies an honours or pass degree is required; for the others a Higher National Certificate is adequate. Some of the vacancies are in connection with a large new project shortly to be put into operation. The work will be varied and interesting, and there will be good scope for advancement. Starting salaries in accordance with age, technical qualifications and experience.—Apply with full particulars to

THE CHIEF ENGINEER, A. REYROLLE AND CO. LTD., HEBBURN, CO. DURHAM.

(D 586p)

TRANSFORMERS

ASSEMBLY INSPECTOR with good practical experience of units up to about 10,000 kVA.

DRAUGHTSMEN with some experience on units in the range 500 kVA to 10,000 kVA.

TEST ASSISTANTS with some practical experience of transformer work.

Salaries according to qualifications.

Apply: **Technical Director**

BRYCE ELECTRIC CONSTRUCTION Co. Ltd., Kelvin Works, Hackbridge, Surrey

(D 611p)

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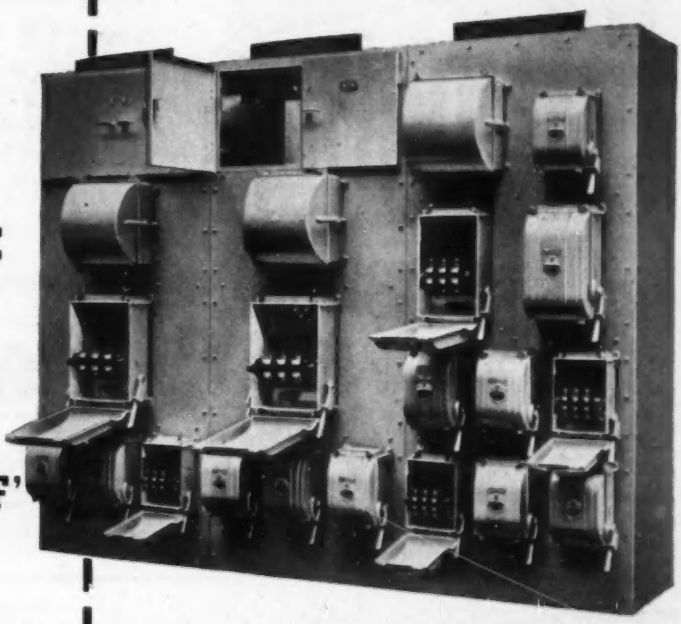

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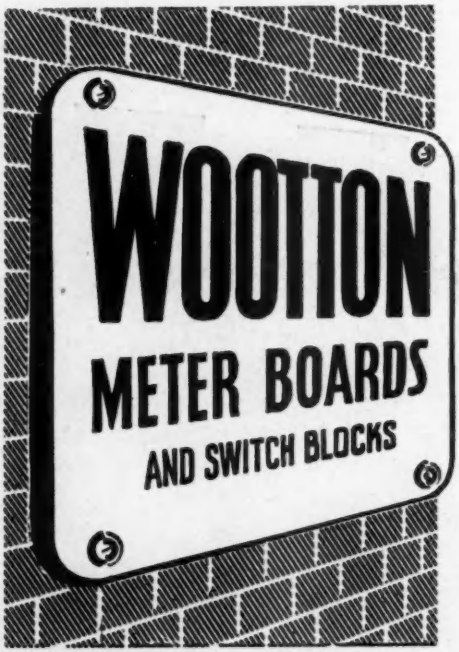

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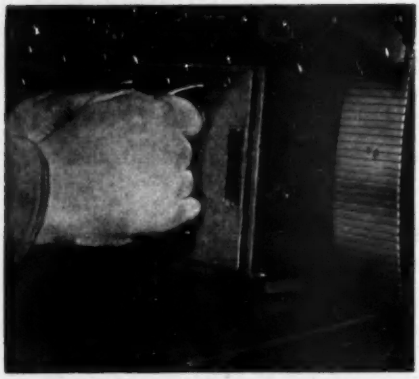

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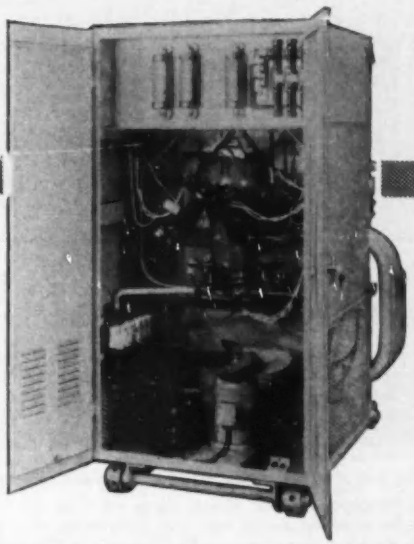

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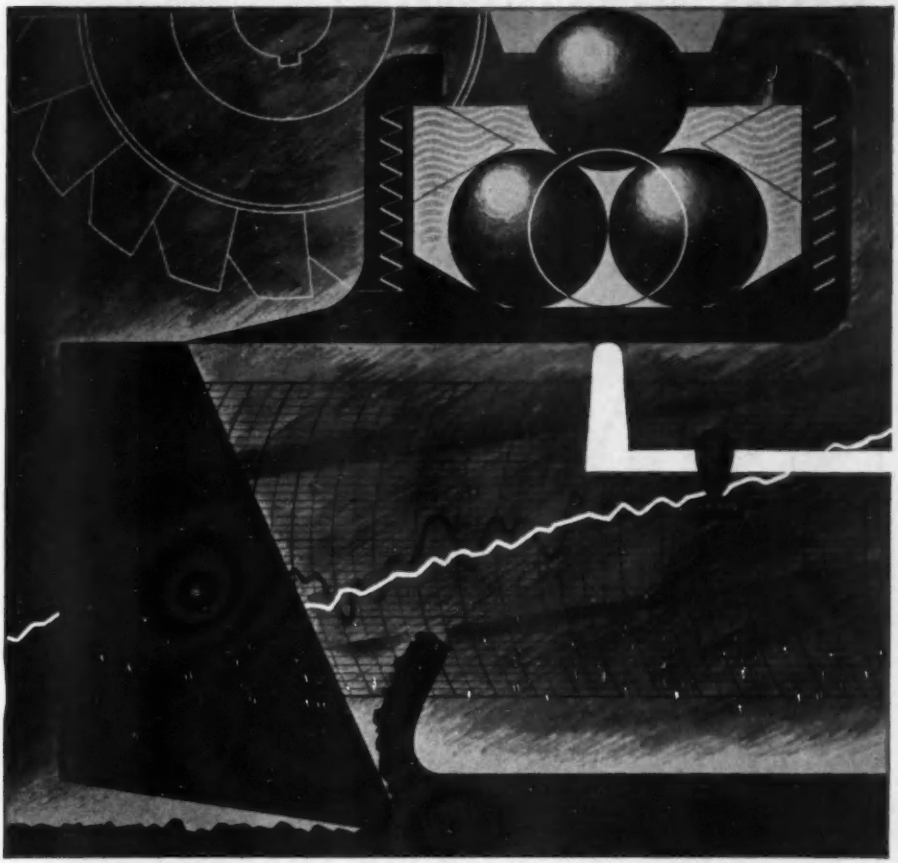

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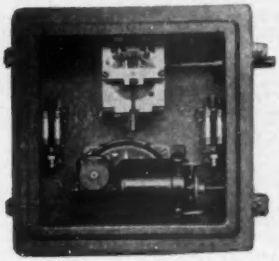

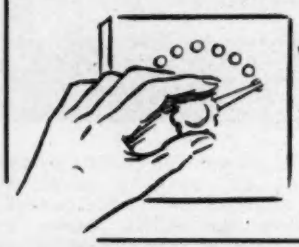

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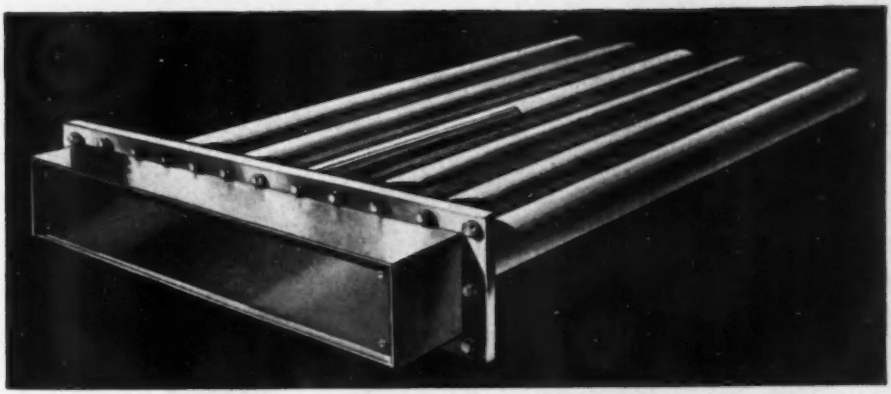

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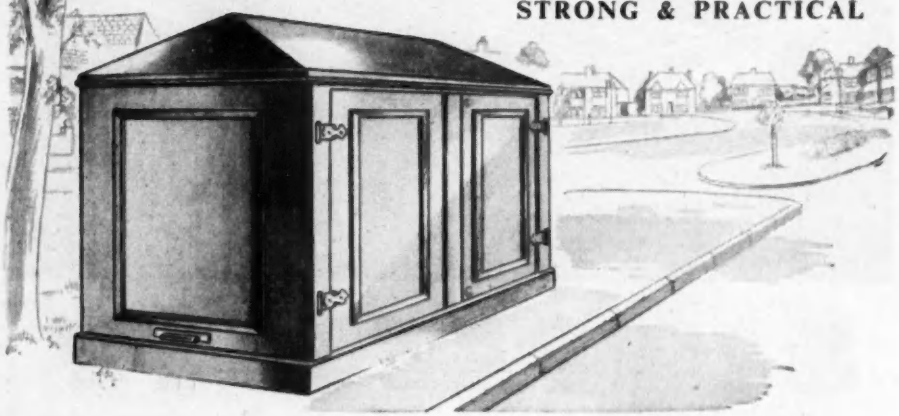

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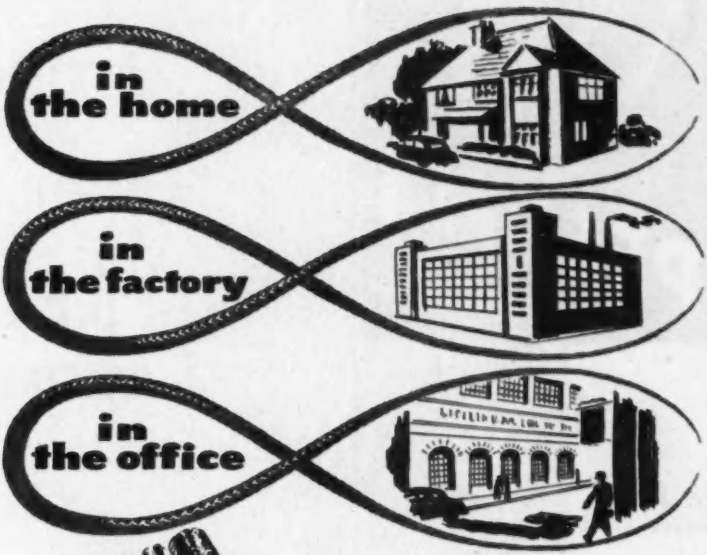

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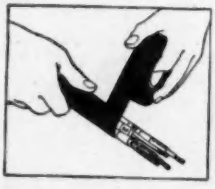

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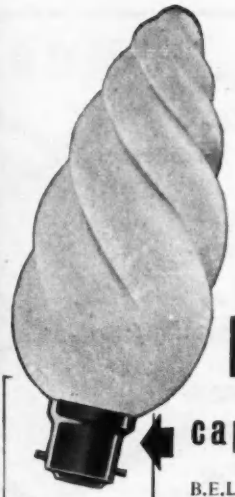

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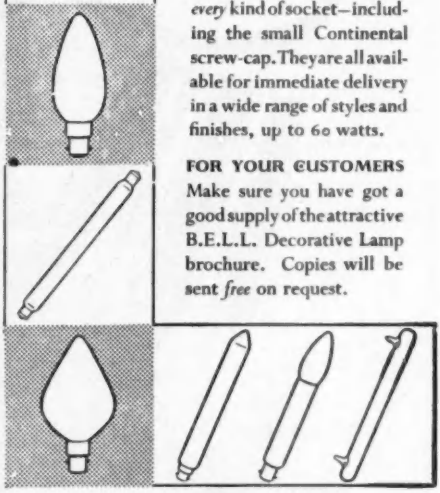

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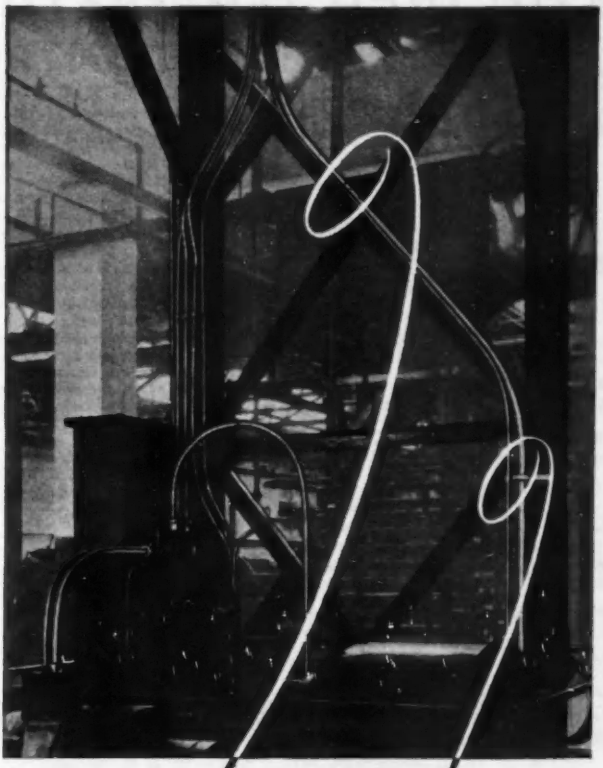

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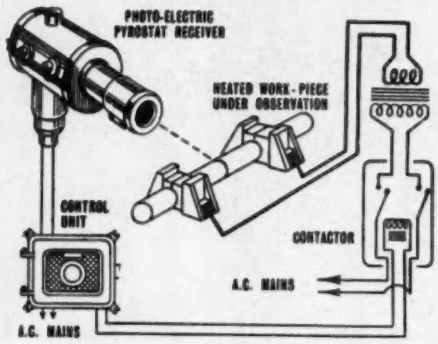

The difficulty of controlling temperature when employing direct resistance or eddy current heating in butt welding, up-setting and similar operations is well known.

The Radiovisor Pyrostat Controller provides automatic and instantaneous control by measuring the visible light radiations emitted from the heated workpiece. Radiations from the workpiece fall on to a photo-electric cell which converts light intensity into electrical energy, and at the desired temperature the heating current to the workpiece is automatically switched off.

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● G.E.C. has had many years' experience in the design and construction of heating plant. The company's specialists welcome opportunities to discuss potential uses with engineers and metallurgists.

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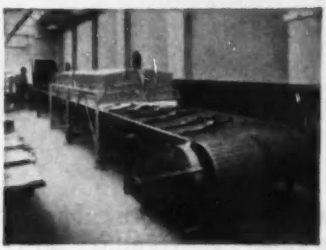

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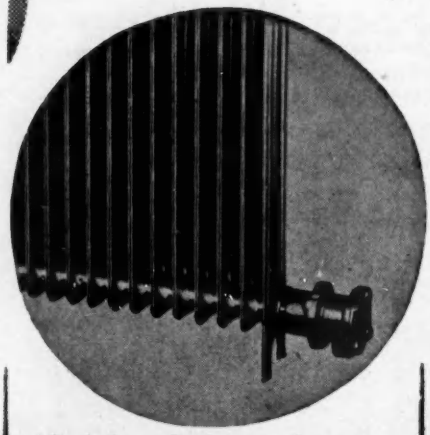

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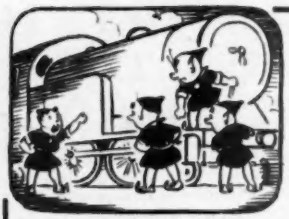

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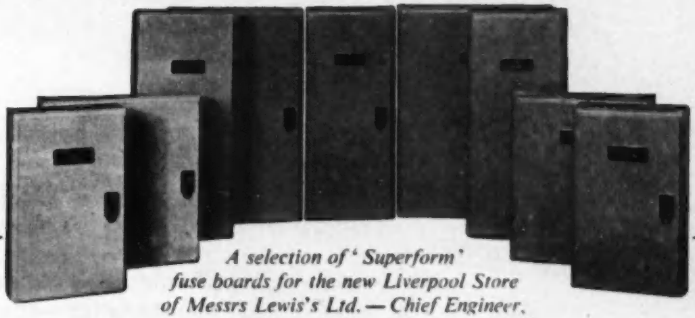

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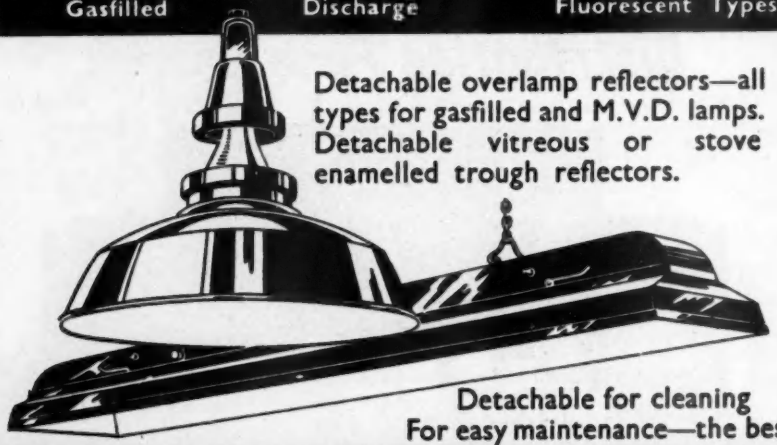

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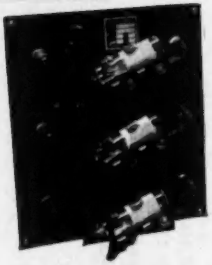

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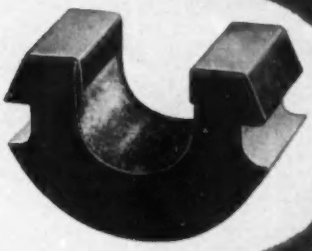

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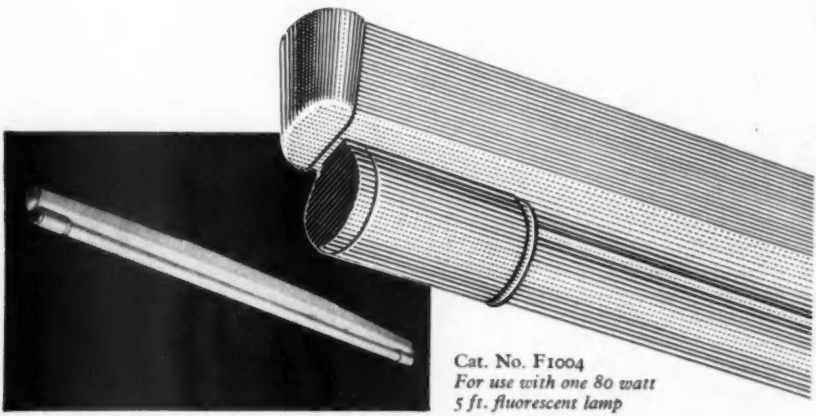

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